HONI SOIT QUI MAL Y PENSE
DIEU ET MON DROIT

AGRICULTURAL RESEARCH INSTITUTE
PUSA

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, F.R.S., F.L.S., F.G.S.,
AND
WILLIAM FRANCIS, JUN., F.L.S.

VOL. X.—SEVENTH SERIES.

LONDON:
PRINTED AND PUBLISHED BY TAYLOR AND FRANCIS.
SOLD BY SIMPKIN, MARSHALL, HAMILTON, KENT, AND CO., LD.;
BAILLIÈRE, PARIS: HODGES, FIGGIS, AND CO., DUBLIN:
AND ASHER, BERLIN.
1902.

"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ: ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal,* Leyden, 1767.

. . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

ALERE FLAMMAM.

CONTENTS OF VOL. X.

[SEVENTH SERIES.]

NUMBER LV.

Page

I. Notes on Scottish Crustacea. By Thomas Scott, F.L.S. (Plate I.) 1

II. Descriptions of some new Species of African *Solifugæ* and *Araneæ*. By R. I. Pocock. (Plates II. & III.) 6

III. Notes on some Recent Publications concerning Diatoms. By P. T. Cleve and C. Mereschkowsky 27

IV. On the Genus *Latrodectus*, Walck. By Frederick Pickard Cambridge, B.A., F.Z.S. 38

V. Contributions from the New Mexico Biological Station.—XIII. On the Bees of the Family *Nomadidæ* of Ashmead. By T. D. A. Cockerell and Emerson Atkins 40

VI. New and little-known Species of Eastern and Australian Moths. By Colonel C. Swinhoe, M.A., F.L.S., &c. 47

VII. Descriptions of a new South-African Galeid Selachian. By G. A. Boulenger, F.R.S. (Plate IV.) 51

VIII. Further Remarks on the Carboniferous Ganoid, *Benedenius deneensis*, Traquair. By G. A. Boulenger, F.R.S. 52

IX. Notes on the Phyllostomatous Genera *Mimon* and *Tonatia*. By Oldfield Thomas 53

X. Descriptions of new Species of Fossorial Hymenoptera from the Khasia Hills, Assam. By P. Cameron 54

XI. Diagnoses of new Cichlid Fishes discovered by Mr. J. E. S. Moore in Lake Nyasa. By G. A. Boulenger, F.R.S. 69

New Books:—Palæontologia Indica. Series XVI. Vol. I. Part 3. Fauna of the Upper Cretaceous (Maestrichtian) Beds of the Mari Hills. By Fritz Noetling, Ph.D., Palæontologist, Geol. Surv. India.—Notes on the Morphology of the Pelecypoda. By Fritz Noetling, Ph.D., F.G.S. Palæontologia Indica. New Series. Vol. I. Part 2 .... 71—73

Proceedings of the Geological Society 75, 76

NUMBER LVI.

Page

XII. Descriptions of new Species of Fossorial Hymenoptera from the Khasia Hills, Assam. By P. Cameron 77

XIII. Some Notes on Nomenclature. By Frederick Pickard Cambridge, B.A., F.Z.S. 89

XIV. The Morphology of the Madreporaria.—II. Increase of Mesenteries in *Madrepora* beyond the Protocnemic Stage. By J. E. Duerden, Ph.D., A.R.C.Sc. (Lond.), Bruce Fellow, Johns Hopkins University 96

XV. A Revision of the Fishes of the Family *Stromateidæ*. By C. Tate Regan, B.A. 115

XVI. On the Pelvic Fins in the Postlarval and Young Stages of *Onus mustela* (the Five-bearded Rockling). By David M Paul, Gatty Marine Laboratory, St. Andrews. (Plate V.) 132

XVII. Notes and Descriptions of some *Dynastidæ* from Tropical America, chiefly supplementary to the 'Biologia Centrali-Americana.' By Gilbert J. Arrow, F.E.S. 137

XVIII. Notes on the Classification of Teleostean Fishes.—III. On the Systematic Position of the Genus *Lampris*, and on the Limits and Contents of the Suborder *Catosteomi*. By G. A. Boulenger, F.R.S. 147

XIX. Descriptions of Two new South-American Apodal Batrachians. By G. A. Boulenger, F.R.S. 152

XX. Description of a new Cyprinodontid Fish from Eastern Peru. By G. A. Boulenger, F.R.S. 153

XXI. The Stridulating-organ in the Egyptian Beetle, *Graphipterus variegatus*. By R. I. Pocock 154

XXII. On *Marmosa marmorata* and *elegans*, with Descriptions of new Subspecies of the latter. By Oldfield Thomas 158

XXIII. The Genet of the Balearic Islands. By Oldfield Thomas. 162

XXIV. On Two new Mammals from China. By Oldfield Thomas, F.R.S. 163

XXV. A new Vole from the Lower Yang-tse-kiang. By Oldfield Thomas 166

XXVI. Diagnosis of a new Central-American Porcupine. By Oldfield Thomas 169

New Book:—Palæontologia Indica. Series IX. Vol. II. Part 2. The Jurassic Corals of Cutch. By J. W. Gregory, D.Sc., F.G.S. 170

NUMBER LVII.

Page

XXVII. Rhynchotal Notes.—XIV. *Heteroptera*: Families *Hydrometridæ*, *Henicocephalidæ*, and *Reduviidæ* (part.). By W. L. Distant ... 173

XXVIII. A Revision of the Fishes of the Family *Stromateidæ*. By C. Tate Regan, B.A. ... 194

XXIX. On the Hymenoptera collected by Mr. W. L. Distant in the Transvaal, South Africa, with Descriptions of supposed new Species. By Lieut.-Colonel C. T. Bingham ... 207

XXX. On new Species of *Histeridæ* and Notices of others. By G. Lewis, F.L.S. ... 223

XXXI. Descriptions of Five new Species of *Locustidæ* from South Africa. By W. F. Kirby, F.L.S., F.E.S. ... 239

XXXII. A new Dik-Dik from British East Africa. By Oldfield Thomas ... 242

XXXIII. On a new Monkey from Nyasaland. By Oldfield Thomas, F.R.S. ... 243

XXXIV. On Two new Hares allied to *Oryctolagus crassicaudatus*. By Oldfield Thomas ... 244

XXXV. New Forms of *Saimiri*, *Oryzomys*, *Phyllotis*, *Coendou*, and *Cyclopes*. By Oldfield Thomas ... 246

XXXVI. On the Panda of Sze-chuen. By Oldfield Thomas.. 251

XXXVII. Notes from the Gatty Marine Laboratory, St. Andrews. —No. XXIII. By Prof. M'Intosh, M.D., LL.D., F.R.S., &c. (Plate VI.) ... 252

XXXVIII. List of the Fishes collected by Mr. W. L. S. Loat at Gondokoro. By G. A. Boulenger, F.R.S. ... 260

NUMBER LVIII.

XXXIX. On new Species of *Histeridæ* and Notices of others. By G. Lewis, F.L.S. ... 265

XL. On the Systematic Position of *Luvarus imperialis*, Rafinesque. By C. Tate Regan, B.A. ... 278

XLI. Rhynchotal Notes.—XV. *Heteroptera*: Family *Reduviidæ* (continued), *Piratinæ* and *Ectrichodinæ*. By W. L. Distant ... 282

XLII. Notes on the Classification of Teleostean Fishes.—IV. On the Systematic Position of the *Pleuronectidæ*. By G. A. Boulenger, F.R.S. ... 295

XLIII. A new Arrangement of the existing Species of *Equidæ*, with the Description of a new Subspecies of "Zebra." By R. I. Pocock ... 304

Pag

XLIV. On the East-African Representative of the Bongo and its Generic Position. By Oldfield Thomas, F.R.S. 30

XLV. On some new Forms of *Otomys*. By Oldfield Thomas.. 311

XLVI. Some new African Spiders. By R. I. Pocock 315

XLVII. Descriptions of Two new Coleoptera of the Family *Buprestidæ*. By Chas. O. Waterhouse, F.E.S. 330

XLVIII. Description of Two new Helicoid Land-Shells. By G. K. Gude, F.Z.S. 332

New Books.—International Catalogue of Scientific Literature. First Annual Issue. *M*. Botany. Vol. I. Part 1.—The Fauna of British India, including Ceylon and Burma. Edited by W. T. Blanford. Rhynchota. Vol. I. (Heteroptera). By W. L. Distant.—Palæontologia Indica. Series XV. Himálayan Fossils. Vol. III. Part 1. Upper Triassic Cephalopod Faunæ of the Himálaya. By Dr. Edmund Mojsisovics, Edlem von Mojsvar, Imp. Acad. Vienna, &c. Translated by Dr. Arthur H. Foord, F.G.S., and Mrs. A. H. Foord.—Palæontologia Indica. Series XVI. Baluchistán. Vol. I. The Jurassic Fauna. Part 1. The Fauna of the Kellaways of Mazár Drik. By Fritz Noetling, Ph.D., F.G.S., &c. 333–340

NUMBER LIX.

XLIX. Notes on the Natural History of East Finmark. By Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., F.L.S. 341

L. On a new Species of *Paramithrax* from New Zealand. By George M. Thomson, F.L.S. (Plates VII. & VIII.) 361

LI. A Contribution to the Systematics of Scorpions. By R. I. Pocock 364

LII. Description of a new Genus and Species of Apterous Locust from Ecuador. By W. F. Kirby, F.L.S., F.E.S.... 380

LIII. The Morphology of the Madreporaria.—III. The Significance of Budding and Fission. By J. E. Duerden, Ph.D., A.R.C.Sc. (Lond.), Bruce Fellow, Johns Hopkins University 382

LIV. Descriptions of new Batrachians and Reptiles from the Andes of Peru and Bolivia. By G. A. Boulenger, F.R.S. 394

LV. On the Genus *Ateleopus* of Schlegel. By G. A. Boulenger, F.R.S. 402

LVI. A new *Rhynchocyon* from Nyasaland. By Oldfield Thomas 403

LVII. On new Species of South-African *Curculionidæ* of the Genus *Hipporrhinus*, Schon By Guy A. K. Marshall, F.Z.S. .. 404

Page

LVIII. The Specific Name of the Okapi presented by Sir Harry Johnston to the British Museum. By E. Ray Lankester, M.A., LL.D., F.R.S., Director of the Natural History Department of the British Museum 417

New Books:—Palæontologia Indica New Series. Vol. I. Part 3. Fauna of the Miocene Beds of Burma. By Fritz Noetling, Ph.D., F.G.S., Palæontologist, Geological Survey of India.—Biologia Centrali-Americana. Hemiptera-Heteroptera. Vol. II. By G. C. Champion.—*Gephyrocrinus Grimaldii*, Crinoïde nouveau provenant des campagnes de la 'Princesse Alice.' By R. Koehler and F. A. Bather 418–420

NUMBER LX.

LIX. Descriptions of new Fishes from the Collection made by Mr. E. Degen in Abyssinia. By G. A. Boulenger, F.R.S. 421

LX. On new Species of South-African *Curculionidæ* of the Genus *Hipporrhinus*, Schon. By Guy A. K. Marshall, F.Z.S 439

LXI. On a Collection of Snakes from North-western Argentina and Bolivia containing new Species. By Dr. Einar Lönnberg .. 457

LXII. Some Recent Additions to and Notes on the Crustacean Fauna of New Zealand. By George M. Thomson, F.L.S. 462

LXIII. Some *Coccidæ* from Mexico. By T. D. A. Cockerell .. 465

LXIV. Notes on the Natural History of East Finmark. By Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., F.L.S. 472

LXV. On Five new Mammals from Arabia and Persia. By Oldfield Thomas 487

LXVI. Two new Australian Small Mammals. By Oldfield Thomas 491

LXVII. On Azara's "Chauve-souris onzième" (*Myotis ruber*, Geoff.) and a new Species allied to it. By Oldfield Thomas 493

LXVIII. Description of a new Snake of the Genus *Pseudechis* from Queensland. By G. A. Boulenger, F.R.S. 494

LXIX. New Eastern Heterocera. By Colonel C. Swinhoe, M.A., F.L.S., &c. 495

LXX. Some Points in the Morphology and Classification of the *Opiliones*. By R. I. Pocock. (Plates IX. & X.) 504

Page

LXXI. On the Mole of the Roman District. By Oldfield Thomas 516

New Books:—First Steps in Photo-Micrography. A Handbook for Novices. By F. Martin Duncan, F.R.H.S.—Report on the Collections of Natural History made in the Antarctic Regions during the Voyage of the 'Southern Cross' 517

Note on the *Histeridæ* (Ann. & Mag. Nat. Hist. 1902, vol. x. p. 273), by G. Lewis, F.L.S. 519

Index 520

PLATES IN VOL. X.

Plate I. Scottish Crustacea.
II. } III. } New African Solifugæ and Araneæ.
IV. New South-African Galeid Selachian.
V. Pelvic fins of Onus mustela.
VI. New species of Ceratocephala.
VII. } VIII. } New species of Paramithrax.
IX. } X. } Morphology of the Opiliones.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

> "................ .. per litora spargite muscum,
> Naiades, et circum vitreos considite fontes:
> Pollice virgineo teneros hic carpite flores:
> Floribus et pictum, divæ, replete canistrum.
> At vos, o Nymphæ Craterides, ite sub undas;
> Ite, recurvato variata corallia trunco
> Vellite muscosis e rupibus, et mihi conchas
> Ferte, Deæ pelagi, et pingui conchylia succo.
> *N. Parthenii Giannettasii*, Ecl.

No. 55. JULY 1902.

I.—*Notes on Scottish Crustacea.*

By Thomas Scott, F.L.S.

[Plate I.]

(1) ISOPODA.

Pleurocrypta longibranchiata (Bate & Westwood), G. O. Sars.
(Pl. I. figs. 1 & 2.)

The female and male specimens of *Pleurocrypta* represented by the figures 1 and 2 (Pl. I.) were obtained on a specimen of *Galathea* captured in the Clyde and sent to me by Mr. Alexander Patience, of Glasgow.

The female is nearly symmetrical in form, and its outline, seen from below, is somewhat ovate. The greatest width, which is near the anterior end, is equal to rather more than half the entire length; the anterior end is broadly rounded, but posteriorly the body becomes gradually narrower and terminates in a small subquadrangular plate. The pleopods and uropods are considerably elongated, but the uropods are more slender than the other appendages, as shown in the figure (fig. 1).

The male is somewhat depressed, and when viewed from above is nearly cylindrical. It is very nearly 2 millim. long and its breadth is equal to fully one third of the entire length; the forehead is broadly and evenly rounded; the metasome consists of an entire piece of a triangular form, the apex of which is somewhat blunt-pointed.

Both the female and male of this Clyde parasite agree very well with the description and figures of *Pleurocrypta longibranchiata* as given in Prof. G. O. Sars's recently published monograph on the Norwegian Isopoda*, but they differ slightly from the description and figures of the same species in vol. ii. of 'British Sessile-eyed Crustacea' by Bate and Westwood†, the difference being more marked in the male than in the female; the last-mentioned authors in their description of the male state that the "pleon (metasome of G. O. Sars) is composed of an elongate ovate-conic piece, in which the segments are fused together," and their figure of the male corresponds with the description. Notwithstanding this difference and the proportionally narrower form of the female, Professor G. O. Sars believes that the species described by him "is identical with that described in 'British Sessile-eyed Crustacea' as *Phryxus longibranchiatus*." It may be remarked that M. Bonnier, in his excellent monograph ‡, while accepting the identification of the learned author of the 'Crustacea of Norway,' does so with a certain amount of reserve.

The *Galathea* on which the *Pleurocrypta* recorded here was obtained appeared to be somewhat immature; at first I thought it might be the *Galathea nexa*, Embleton, the species on which G. O. Sars obtained his specimens of *Pleurocrypta longibranchiata*; but I am now inclined to ascribe it to the more common *Galathea dispersa*, Spence Bate; it agrees better with this species in the form of the rostrum than with either *G. nexa* or *G. squamifera*, Leach, which belong to the same group as *G. dispersa*. In an interesting monograph of the "Galatheidæ des Côtes de France" by M. Jules Bonnier §, the author divides *Galathea* into three groups:—1st, species furnished with an epipodite on the first pair of thoracic feet only; this includes only one species, *Galathea intermedia*, Lilljeborg. 2nd, species furnished with epipodites on the first three pairs of thoracic feet; this group comprises *G. squamifera*, *G. nexa*, and *G. dispersa*. 3rd, species without epipodites on the thoracic feet; only one *Galathea* (*G. strigosa*, Fabr.) belongs to this group. Our *Galathea* belongs to the middle group, but the second and third joints of the third maxillipeds differ somewhat in their proportional lengths from the three species composing the group. I am inclined, however, to ascribe it to the last one, as the form of the rostrum agrees more closely with the rostrum of that species.

---

* 'Crustacea of Norway,' vol. ii. p. 206, pl. lxxxvi. fig. 2 (1898).

† 'British Sessile-eyed Crustacea,' vol. ii. p. 246 (1868).

‡ 'Contribution à l'Étude des Épicarides : les Bopyridæ,' p. 316 (1900).

§ 'Bulletin Scientifique de la France et de la Belgique' (1888), pp. 35 95.

Pleurocrypta Patienceı, sp. n.
(Pl. I. figs. 3, 4.)

This *Pleurocrypta* was obtained on a specimen of *Caridion Gordoni* (Spence Bate) dredged in the Clyde by Mr. Alexander Patience, of Glasgow, who kindly presented it to me, and in compliment to whom I have named it.

The parasite was attached, as usual, under the cephalic shield, and in the present instance on the left side, of the *Caridion*, and is represented by both male and female specimens.

The female is distinctly unsymmetrical, and measures about 4·6 millim. (nearly $\frac{1}{5}$ of an inch) in length; the greatest width, which is near the middle, is equal to about two thirds of the length. The anterior end is obliquely truncate, while posteriorly the sides converge somewhat evenly and terminate in a bluntly rounded apex. The cephalon is deeply immerged in the first segment of the mesosome, and in this respect the female resembles a female *Bopyrus* or *Bopyroides*. The uropoda consist of two small elongate-oval plates, similar to those of *Pleurocrypta microbranchiata*, G. O. Sars (*P. intermedia*, Giard and Bonnier), and the pleopoda are also, as in that species, scarcely developed.

The male is subcylindrical and moderately narrow (fig. 4); its entire length is about 1·6 millim. ($\frac{1}{16}$ of an inch) and its greatest width is equal to rather more than one third of the length. The head is small, being scarcely one sixth of the entire length; it is broadly rounded in front and rather narrower than the next segment. The segments of the mesosome, though distinct, are not widely separated from each other, and they are all of nearly equal size. The metasome, as in the males of other *Pleurocrypti*, is composed of one piece; at the proximal end it is about as broad as long, but the sides, which are broadly but slightly unequally rounded, converge posteriorly and terminate in a minute sharp-pointed apex, as shown in the drawing.

So far as I know, *Pleurocrypta Patiencei* appears to be the first Bopyrid parasite that has hitherto been recorded from *Caridion Gordoni*, and this is the more interesting from the fact that these parasites have been so carefully and exhaustively studied by such eminent investigators as Prof. Giard and M. Bonnier in France and Prof. G. O. Sars in Norway.

Pleurocrypta cluthæ, sp. n. (Pl. I. fig. 5.)

I am indebted for this Bopyrid to the same gentleman who sent me the species just recorded. *Pleurocrypta cluthæ* was obtained on a specimen of *Pandalina* (*Pandalus*) *brevirostris* (Rathke) dredged in the Clyde on April 16th, and is probably identical with the form observed by Dr. (now Professor) J. R. Henderson in the branchial chamber of *Pandalina brevirostris*, and referred to by him under the general name of "*Bopyrus*" in his work on "The Higher Crustacea of the Clyde" *, and which M. Jules Bonnier, in his monograph on the Bopyridæ already mentioned, ascribes doubtfully to the genus *Pseudione* †. It is not likely that M. Bonnier had at this time examined specimens of the Bopyrid referred to—at least he had not seen a specimen of a male, which, as will be shown, is different from the male of *Pseudione*.

The female is about 3·5 millim. (⅐ of an inch) in length, and in its general form, which is somewhat similar to *Pleurocrypta Patiencei*, is distinctly unsymmetrical. The anterior end is obliquely truncate and the head deeply immerged in the first segment of the mesosome. The pleopoda are scarcely developed and the uropoda are very like those of *Pleurocrypta Patiencei*.

The male (fig. 5) is slightly over a millimetre in length and is elongate, narrow, and subcylindrical, its greatest width being scarcely equal to one third of the entire length. The cephalon is bluntly rounded in front and is somewhat narrower than the first segment of the mesosome, to which it appears to be closely applied; the segments of the mesosome are, for the most part, widely separated, as in the male of *Pleurocrypta Hendersoni*, Giard and Bonnier (*P. marginata*, G. O.

---

* Nat. Hist. Soc. Glasg., Trans. vol. i. (n. s.) p. 87 (1886).

† 'Les Bopyridæ,' by M. Jules Bonnier, p. 300 (1900).

Sars). The metasome, which is undivided, is somewhat triangular in form and rather narrower than the segment of the mesosome to which it is articulated. The sides of the metasome converge gradually and equally to the blunt-pointed apex, as shown in the drawing, and its length is equal to about one fifth of that of the entire animal.

Pleurocrypta cluthæ appears to some extent to combine the characters of *P. Hendersoni* and *P. Patiencei*, the female being not unlike the female of the latter species, while, on the other hand, the male is very nearly similar to the male of the former.

All the three species I have recorded appeared to be fully mature.

(2) AMPHIPODA.

Tryphana Malmii, Boeck.

A single specimen of this somewhat rare Amphipod was obtained in the deep water about 9 or 10 miles off Aberdeen. Prof. G. O. Sars states that Boeck obtained his specimens at a considerable depth in the outer part of the Hardangerfjord in Norway, and that it has been taken by himself at three other localities*. Bovallius records its occurrence off the Færoe Islands, and the Rev. T. R. R. Stebbing in the North Atlantic, lat. 18° 8′ N., long. 30° 5′ W.; but apparently the only British record other than the present is that of the Rev. A. M. Norman, who, on behalf of the late T. Edward, records it from Banff†.

It is customary by some learned authors to modify "*Tryphana*," the name adopted by Boeck, and use "*Tryphæna*" instead; but the Rev. T. R. R. Stebbing does not approve of the change, and considers that the name as used by Boeck ought to be retained.

EXPLANATION OF PLATE I.

Fig. 1. *Pleurocrypta longibranchiata* (B. & W.), female. × 16.
Fig. 2. Ditto, male. × 38½.
Fig. 3. *Pleurocrypta Patiencei*, sp. n., female. × 19.
Fig. 4. Ditto, male. × 38½.
Fig. 5. *Pleurocrypta cluthæ*, sp. n., male. × 77.

---

* 'Crustacea of Norway,' vol. i. p. 18.

† Canon A. M. Norman, "On British Amphipoda," Ann. & Mag. Nat. Hist. (7) vol. v. (January 1900).

II.—*Descriptions of some new Species of African* Solifugæ *and* Araneæ. By R. I. Pocock.

[Plates II. & III.]

With the exception of the first species mentioned in this paper, all the new forms here recorded have been received within the last few years from South Africa. Most of them were collected by Miss Leppan. Those obtained by Mrs. White were sent to the British Museum by Dr. Schönland, Curator of the Albany Museum, Grahamstown.

Order SOLIFUGÆ.

Genus Dæsia, Koch.

Dæsia bellula, sp. n. (Pl. II. figs. 1, 1 *a*.)

♀.—*Colour.* Mandibles yellow, with dorsal brown stripes; head brown, with oval yellow median patch; abdomen yellowish, with three narrow tergal stripes; palpi from the distal half of the femur to the end infuscate; first and second legs only weakly infuscate, third and fourth (especially the fourth) more strongly infuscate, except at the base and apex, which are pale.

Carapace a little shorter than patella of fourth leg, equal to that of palp, a little shorter than tibia and tarsus of palp. Of the four distal teeth on the upper jaw of the *mandible* the first is smaller than the second, the second and fourth are about equal and largest, and the third smallest; one intermediate tooth on the lower jaw.

Palpi entirely without spines, clothed with short hairs and long bristles, which, at least on the lower border of the patella, show a symmetrically paired arrangement.

♂.—Smaller than female, but like it in colour except for the indistinctness of the mandibular bands.

Carapace only about two thirds the length of the patella or tibio-tarsus of palp.

Flagellum oval, with narrowed upcurled extremity, its dorsal border folded over, and a small tuft of short hairs at its proximal end. Upper jaw of *mandible* furnished with a deep oval hollow behind the terminal fang, which distally extends forwards as a narrow channel on each side of the fang, the two being separated by a longitudinal crest; the internal edge of the hollow deeply notched posteriorly, and behind the notch are some small teeth which precede the large principal tooth; behind the latter follow four subequal external cheek-teeth; lower jaw toothed as in the female. Patella of *palp* with long setæ beneath; tibia with five inner and three outer strong spines at its distal end.

Measurements in millimetres.— ♀. Total length 15; width of head 4; length of palpus 13·5, of fourth leg 20.

♂. Total length 13; width of head 2·5; length of palpus 15.

Loc. Egypt: Wady Sikait (*D. Macalister*).

Evidently nearly related to another Egyptian species, *D. Ehrenbergi*, Simon, which has a similar hollow on the upper jaw of the mandible. In the latter, however, the hollow is a complete oval, not divided in front and without a notch on its internal edge. The first long tooth, too, is relatively much shorter. The female seems to differ principally in colour from that of *Ehrenbergi*, *tunetana*, and *velox*.

Genus BROOMIELLA, nov.

Allied to *Dæsia* in having the tarsi of second and third legs bisegmented, the distal segment not half the length of the proximal, but differing in that the tarsus of the fourth is also bisegmented, with the distal segment one third the length of the proximal.

In *Dæsia* the segment that corresponds to the proximal segment of *Broomiella* has a couple of complete joints near its distal end, so that there are four distinct tarsal segments on the fourth leg.

Type *Broomiella lineata*.

Broomiella lineata, sp. n. (Pl. II. figs. 3, 3 *a*, 3 *b*.)

♂.—*Colour.* Carapace infuscate, mesially pale; tergites with three brown spots, forming a median and a right and left lateral stripe on the back; ventral surface and bases of appendages quite pale; palpi infuscate, legs also infuscate, with pale extremities; mandibles with lightly defined dark stripes.

Width of *carapace* less than length of patella or tibia of palp, about equal to tibia of fourth leg.

Mandible with upper jaw strong, stout, distally pointed, hollowed out on its inner side, projecting nearly straight forwards, strongly toothed, the first tooth represented by a small excrescence, the second large, third minute, fourth long; lower jaw with two long principal teeth, one minute inner tooth behind the proximal of these and one between them.

Flagellum with lower edge straight, upcurled, upper edge strongly convex proximally.

Palpi clothed with fine short hairs and furnished with long bristles; the tibia without cylindrical bristles, armed below with four pairs of spines or spiniform bristles; the three distal of these on the inner side and the one distal on the outer are short spines, and the rest are apically setiform.

Protarsus of third *leg* armed with five upper spines and three inferior, two of which are apical, the other anterior; the proximal tarsal segment with two anterior spines; third leg similarly armed, except that two of the dorsal protarsal spines take a posterior position; fourth leg without the dorsal protarsal spines, but otherwise similarly armed with an additional small spine on the base of the proximal tarsal segment in front.

Second sternal plate of abdomen with numerous short and stout clavate bristles clustered on each side of the middle line.

Measurements in millimetres.—Total length 14; width of head 3·5; length of palpus 15, of fourth leg 18 (both measured from base of femur).

Loc. Pearston, in Cape Colony (*Dr. R. Broom*).

A single male example.

Genus Ceroma, Karsch.

Ceroma pictulum, sp. n. (Pl. II. fig. 2.)

♂.—*Colour* yellow; mandibles with three black stripes; carapace with black ocular tubercle, two ill-defined black stripes behind it and a broader irregular one on each side; abdomen with three sharply defined narrow black stripes above; legs and palpi infuscate, pale basally, quite pale laterally and below.

Flagellum of male very long, reaching to the middle of the thoracic portion of the carapace, not curved inwards, but ending in a slightly enlarged tip, which appears to be minutely forcipate (?); base of flagellum on inner side protected by seven feathery bristles. Upper fang of *mandible* slender, excavated, lightly curved, armed with only two small teeth in addition to the cheek-teeth, one near the base and the other nearly halfway along the fang on the inner rim of the excavation. Lower jaw armed with two relatively small and close-set teeth, the distal of which is smaller; beyond the latter the cutting-edge is convex and sinuous. Tibia of second and third *legs* with three dorsal spines. *Pulvillus* deeply cleft.

Total length 15 millim.

Loc. Tea Fountain, near Grahamstown (*Miss Leppan*).

Resembling *C. Sclateri*, Purc., in colour, spine-armature of second and third legs, deeply divided pulvillus, &c., but differing entirely in the weak dentition of the mandibles.

Order ARANEÆ.

Family **Ctenizidæ**.

Genus ACANTHODON, Guér.

Acanthodon ochreolum, sp. n. (Pl. II. figs. 5, 5 *a*.)

♂.—Of about the size, colour, and general appearance of *A. Thorellii*, Cambr. (P. Z. S. 1870, p. 156, pl. viii. fig. 6; also Pocock, Ann. & Mag. Nat. Hist. (7) i. p. 320, 1898), but with the protarsus of the first leg arcuate in its basal half, with concavity looking inwards, geniculate just past the middle, the remainder of the segment running straight forwards; the tibial spurs, too, are very unequal, the distal being long, twice as long as the proximal, which is short and conical; the tibia is armed beneath with four spines, the protarsus with two. Except that the patella and tibia are more inflated, the palpus has much the same form in the two species. Anterior median eyes much larger than in *A. Thorellii*, hardly more than half a diameter apart, less than a diameter from the posterior laterals, which are barely half their area.

Total length 9 millim.; carapace 3·5; first leg 13, fourth 13·5.

Loc. Jansenville (*Miss Leppan*).

Genus STASIMOPUS, Simon.

Stasimopus palpiger, sp. n. (Pl. II. figs. 4, 4 *a*.)

♂.—*Colour.* Blackish above, the extremities of the palpi and anterior two pairs of legs distally pale; third and fourth legs yellowish brown, the basal half of each segment darker than the proximal; lower surface pale.

Carapace granular, a little longer than tibia of first leg, equal to protarsus of fourth, shorter than patella and tibia of fourth. *Eyes* of anterior line a little procurved, subequal in size and subequally spaced; eyes of posterior line slightly recurved, small, subequal, the posterior lateral much smaller than anterior lateral and widely separated from it.

Labium and *maxillæ* unarmed.

Palpi unarmed, exceedingly long and slender, about three and a half times as long as carapace, and extending as far as the tip of the first pair of legs; the trochanter cylindrical, four to five times as long as wide; the patella and tibia subequal and nearly as long as the femur; tarsus short, truncate; organ as in fig. (Pl. II. fig. 4 *a*).

Legs of first and second pairs very long and slender, with tarsi scopulate and tibia and protarsi spined beneath; tarsi with one or two spines only; claws with a single basally curved row of eight to ten teeth; third leg with a few short spines on the anterior side of the patella and of the tibia at its distal end; protarsus spined beneath; tarsus scopulate, claw with only two or three strong teeth at the base; fourth leg with patella armed with short spines in front, a few also on the tibia; long spines beneath the distal end of the protarsus and many spines on the tarsus, which is not scopulate and has the claws armed basally with a few large teeth and distally with some small denticles.

Measurements in millimetres.—Total length 10; carapace 5; length of palpus 19, of first leg 19, of second 15, of third 12·5, of fourth 19.

Loc. Graaf Reinet (*Miss Leppan*).

Apart from the greater length of its palpi and legs and less coarse sculpturing of carapace, the male of this species may be distinguished from that of *S. insculptus*, Poc., from King William's Town (Ann. & Mag. Nat. Hist. (7) vii. p. 285), by the following amongst other particulars:—

a. Lateral eyes on each side separated by a space which equals about the long diameter of the anterior and twice the long diameter of the posterior; posterior medians less than their diameter from posterior laterals and barely more than that from anterior laterals .... *insculptus*, Poc.
b. Lateral eyes on each side separated by a space which is much greater than the long diameter of the anterior and about four times that of the posterior; posterior medians at least twice their diameter from the laterals and about four times that from the anterior medians........................ *palpiger*, sp. n.

Stasimopus artifex, sp. n.

In disposition of eyes closely resembling *S. oculatus*, Poc., from Bloemfontein (P. Z. S. 1897, p. 728), as also in the presence of spines on the apex of the protarsus of the third leg beneath and the presence of nearly a dozen spines, the anterior of which are irregularly arranged, upon the apex of the infero-posterior side of the protarsus of the fourth leg; but differing in that the spines on the protarsus are only about six instead of about fifteen in number, and weak instead of strong. Moreover, the labium is furnished with eight cusps instead of two. The legs also are longer, the carapace being shorter and not longer than the patella + tibia + protarsus of the second leg, and only slightly exceeding the tibia + protarsus of the fourth.

Total length 35 millim.; carapace 15; second leg 28, its pat., tib., and prot. 16; fourth leg 33, its tibia and protarsus 14·5.

Loc. Cuylerville, near Grahamstown (*Dr. Schönland*).

(The single specimen of this species bears the ticket "Collected Feb. 28th, 1898, by Mr. A. E. C. W.")

Stasimopus Schönlandi, Poc. (Ann. & Mag. Nat. Hist. (7) vi. p. 319, 1900), differs from *S. oculatus* and *S. artifex* principally in the following particulars:—The ocular area is typically relatively very flat, the tubercles of the anterior lateral eyes being small and low and the anterior median eyes but little raised. The anterior laterals are, as a rule, small and no larger than the anterior medians or posterior laterals, and all the eyes are widely spaced, the distance between the anterior medians and laterals being equal to about three or four times the diameter of the clear area of the medians and always greater than the long diameter of the laterals. The distance between anterior median and anterior lateral about equal to that between the two laterals on each side. The eyes, however, vary considerably, being larger, and therefore apparently much closer together in younger specimens than in the old. There are no spines on the apex of the underside of the protarsus on the third leg, and the comb on the postero-inferior side of the fourth protarsus consists of a compact single row of about six or seven spines. The carapace is as long as the pat. + tib. + prot. of first leg, longer than those of the second, and nearly as long as the tib. + prot. + tarsus of fourth.

Measurements, in millimetres (of large specimen).—Total length 33; carapace 14·5; second leg 22·5, its pat. + tib. + prot. 13·5; fourth leg 33.

The British Museum has received a large number of specimens of this species from Grahamstown (*Dr. Schönland*) and Brak Kloof, near Grahamstown (*Mrs. White*).

Stasimopus astutus, sp. n.

♀.—Very nearly allied to *S. Schönlandi*, but distinguishable by the relative size of the eyes of the anterior line. The laterals transversely elongated, reniform, their long diameter exceeding that of the medians, the space between the lateral and median generally noticeably less than the diameter of the median, and always less, generally very much less, than the long diameter of the lateral; distance between the anterior and posterior lateral eyes on each side much greater than that between the anterior lateral and anterior medians.

Loc. Pearston (*Dr. R. Broom*) and Jansenville (*Miss Leppan*).

Although the relative size of the eyes and the distances between them are subject to considerable variation both with age and individuals, the six specimens presenting the above-described features may be at once distinguished from all the examples of *S. Schönlandi* that I have seen.

The females of this genus known up to the present time may be diagnosed as follows:—

a. No comb of spines on apex of protarsus of fourth leg beneath on the posterior side .... *rufidens*, Auss.
b. A comb of spines on apex of protarsus of fourth leg beneath on the posterior side.
  a^1. Some spines on apex of protarsus of third leg beneath; comb on fourth protarsus consisting of about a dozen spines, the anterior of which are irregularly arranged and intermixed with adjacent setæ.
    a^2. About fifteen strong spines on apex of third protarsus beneath; labial cusps 2; legs shorter .... *oculatus*, Poc.
    b^2. About half a dozen weak spines on apex of third protarsus beneath; labial cusps 8; legs longer .... *artifex*, sp. n.
  b^1. No spines on apex of third protarsus beneath; comb on fourth protarsus formed of a single definite series of 6–7 spines.
    a^3. Distance between the two lateral eyes on each side about equal to the long diameter of the posterior; anterior laterals much larger than anterior medians, the space between them less than the diameter of the medians.. *astutus*, sp. n.
    b^3. Distance between the two lateral eyes never less than twice the long diameter of the posterior, and that between the anterior median and lateral not less than twice the diameter of the anterior median .... *Schonlandi*, Poc.

Genus PELMATORYCTER, nov.

Allied to *Cyrtauchenius*, but with the ocular area scarcely narrowed in front, the posterior line of eyes only the merest fraction wider than the anterior.

Eyes of the anterior line a little procurved, the anterior edge of the medians about their own diameter behind a line touching the anterior edge of the laterals.

Spinning-mamillæ longish, the second segment longer than wide, the third nearly or quite as long as the second and longer than wide, acuminate, all the segments of both pairs of mamillæ studded below with numerous stout spinning-papillæ.

A rastellum of many spines on the distal end of the femur and the proximal end of the patella of the fourth leg.

Type *O. flaviceps*, Poc.*

Pelmatorycter coloniæ, sp. n.

Colour yellowish brown; mandibles darker than head; femora of anterior legs and palpi much darker than distal portion of the appendages.

Carapace a little longer than patella, tibia, and tarsus of palp and than tibia and protarsus of fourth leg, about equal to tibia, protarsus, and tarsus of first leg, nearly one fourth longer than wide, the width about equal to the patella + tibia of first leg.

Eyes of anterior line slightly procurved, subequally spaced, about a diameter of the medians apart, the laterals considerably larger than the medians and much larger than the posterior laterals, which are a little less than their own long diameter from the anterior laterals; posterior medians about midway between the anterior medians and posterior laterals.

Labium and *maxillæ* unarmed.

Mandible with an inner row of strong teeth and many smaller teeth irregularly arranged in two or three rows on the fang-groove. *Palpi* and anterior *legs* weak; tibia of palp armed below with strong spiniform setæ, the tarsus scopulate laterally and with a few spines below. Protarsus of first leg scantily scopulate, armed below with two basal and three distal spines, the tibia with only spiniform setæ below; claws with two complete rows of six or seven teeth. Second leg like the first, but with only two inferior distal protarsal spines. Third leg with patella armed in front with many short spines and a few above; tibia with many in front, four or five above, of which three form a definite series, and two or three distally behind, and one distal and setiform beneath; protarsus with two bands above, each consisting of about fourteen spines, three spines beneath (one proximal, two distal), and about three above the latter; tarsus with two rows of spines above, the anterior

---

* *Cyrtauchenius flaviceps*, Poc. P. Z. S. 1898, p. 506, from British East Africa.

of three, the posterior of six, and with about eight spines below and in front. Fourth leg with its femur furnished distally above and in front with a rastellum consisting of many close-set curved spines; a few similar but shorter spines on the adjacent area of the patella; tibia with one setiform spine below; protarsus and tarsus with numerous spines below and in front, the former with one or two superior spines and the latter with none or one. Claws of third and fourth legs reduced in number, but still showing biserial arrangement. Second segment of posterior spinners longer than wide; third segment much longer than wide, nearly as long as the second and tapering.

Total length 18 millim.; carapace 7; first leg 14, second 13, third 10·5, fourth 15·5.

Loc. Jansenville (*Miss Leppan*).

The two species of this genus known to me may be diagnosed as follows:—

a. Space between anterior and posterior lateral eyes on each side narrow, about one fourth only of the long diameter of the posterior lateral, the anterior not much higher and scarcely longer than the posterior; protarsus of first and second legs with 2+2 proximal spines; tibia of third with 3 spines in front, the upperside of its tarsus with 2 spines in front and 1 behind .... *flaviceps*, Poc.

b. Lateral eyes very unequal in size, anterior much longer and higher than posterior, space between them equal to at least half the long diameter of the posterior; protarsi of first and second legs with 1+1 proximal spines below; tibia of third with more than a dozen anterior spines, its tarsus with 3+5 spines above .... *coloniæ*, sp. n.

Genus HERMÁCHASTES, Poc.

Hermachastes fuliginеus, sp. n.

♀.—*Colour.* Carapace and legs ashy black or ashy brown, upperside of abdomen paler ashy brown, without pattern of pale stripes; under surface pale.

Eyes of anterior line slightly procurved, subequally spaced, or the medians a little nearer the laterals than to each other, distance between them barely a diameter; laterals much larger than medians and larger than the posterior laterals, the space between them more than half the long diameter of the posteriors; posterior medians close to posterior laterals, almost as large as anterior medians, from which they are separated by a space a little exceeding the diameter of the anterior medians.

Carapace slightly longer than pat. + tib. of first or of fourth leg and than prot. + tarsus of these same appendages, distinctly shorter than tib. + protarsus of these same appendages.

Protarsus of first and second *legs* armed beneath with one basal, two submedian, and three apical spines, their tibiæ unspined.

Measurements in millimetres.—Total length 20; carapace 8; first leg 21, fourth leg 20.

Loc. Brak Kloof, near Grahamstown (*Mrs. White*).

This species differs from *H. collinus*, Poc. (Ann. & Mag. Nat. Hist. (7) vi. p. 319, 1900), from Table Mountain, principally in its uniformly blackish-grey colouring. The male will no doubt reveal other distinctive features.

Family **Pisauridæ.**

Thalassius Rossii, sp. n. (Pl. III. fig. 1.)

♀.—*Colour*, Carapace castaneous, the whole of the middle of the upperside covered with a mixture of red and white hairs, the red predominating; a broad rich dark brown band on each side extending from the sides of the clypeus, which is separated from the lateral border by a yellow band formed of red and white hairs, the white predominating. Legs marked above with brown and white; the patella and distal half of tibia brown; femora of first and second whitish, of third and fourth white distally; palpi covered with rusty-red hairs intermixed with white. Integument of upperside of abdomen yellow, thickly covered with a mixture of red and white hairs, the white predominating; this pale field bounded laterally by a broad, sinuous, rich brown band; the whole of the underside tolerably uniformly testaceous.

Carapace rather low, slightly raised in the cephalic region, very distinctly longer than broad, longer than tibia of fourth leg, about as long as that of first; ocular quadrangle very slightly narrowed anteriorly and slightly longer than wide. Anterior median eyes a diameter apart and about the same distance from the anterior laterals and a diameter and a half from the posterior medians, which are a little larger and barely a diameter apart.

Vulva transversely elongate, the lobes meeting in a longish median suture.

Measurements in millimetres.—Total length 14; carapace 6; first leg 22, fourth leg 24.

Loc. Durban (*A. Ross*).

This species resembles in its mottled coloration some West-

African species, but is distinguishable from all by the form of the vulva &c.

In addition to the spider here described, Mr. Ross sent to Mr. W. L. Distant, who kindly handed them on to me to determine, examples of the following species from Durban:—*Nephila pilipes*, *Cyrtophora citricola*, *Argyroepeira Antinorii*, *Aranea nautica*, *Sparassus Spenceri*, and *Sparassus rufilatus*. With the exception of *Aranea nautica* and *Sparassus rufilatus*, all these species were recorded from Durban in my paper on the Arachnida of Natal published in 1898 (Ann. & Mag. Nat. Hist. (7) ii. pp. 197–226). *Sparassus rufilatus* is a particularly interesting capture, the species having been found previously only in the Cameroons. It was described by myself in 1899 (P. Z. S. p. 878) from a single male example. Mr. Ross also sent a male example from Natal. Slight differences are observable in the size of the eyes between the two, but the differences are not sufficient to justify the formation of a new species for the Natal specimen on the material available for comparison. In the synopsis of West-African species of *Sparassus* published in the above-cited work *S. rufilatus* is erroneously accredited with *three* pairs of inferior tibial spines on the first and second legs and *S. benitensis* with *two* pairs, instead of the other way about.

Rothus lineatus, sp. n. (Pl. III. fig. 2.)

As large as *R. catenulatus*, Sim. (Ann. Soc. Ent. Belg. xlii. p. 15, 1898), from Kimberley, and *R. auratus*, Poc., from Namaqualand. *Colour* variable, but apparently not different from that of a species from various parts of Cape Colony which I judge to be *R. vittatus*, Sim. Distinguishable from the other species by the form of the vulva.

In *R. auratus* and *vittatus* the rim of the vulva is thick and the median trilobate sclerite has its lateral lobes not impressed, and the anterior median fovea either scarcely invades the anterior border of the sclerite, which is thus superficially flat (*vittatus*), or extends only about as far as, or a little farther than, the middle of its area. In *R. lineatus*, on the contrary, the anterior fovea is large, semielliptical, and spreads backwards over the middle of the trilobate sclerite almost to its posterior border, dividing it completely into a right and left portion, each of which bears a deep impression; or perhaps the vulva might be appropriately described as having the median trilobate sclerite marked with three deep impressions; rim of vulva narrow, as compared with that of *R. auratus* and *vittatus*.

R. catenulatus of Simon, which is unknown to me, is described as having the vulva impressed with a hairy, semicircular, posteriorly thickly marginate fovea.

Measurements in millimetres.—Total length 15; carapace 5; first and fourth legs 23.

Loc. Queenstown, Cape Colony (*E. T. Wells*).

The British Museum has specimens that I refer to *R. vittatus* from Grahamstown (*Dr. Schönland*); Tea Fountain and Graaf Reinet (*Miss Leppan*).

Spencerella signata, sp. n. (Pl. III. figs. 4, 4 *a*.)

♀.—*Colour.* Carapace with a broad median white band, covered with olive-yellow hairs laterally, whiter towards the margin; head and clypeus white; mandible covered with white hairs above; legs with greyish whitish-yellow hairs; upperside of abdomen with a broad median white band, olive-yellow at sides; under surface whitish, speckled; sternum with median white stripe.

Anterior lateral *eyes* more than two diameters apart, each about equidistant from its fellow and from the lateral angle of head; anterior medians small, a trifle more than a diameter apart and about two diameters from the posterior medians, whose radius they equal in size; quadrangle formed by the posterior median and anterior lateral eyes parallel-sided, about twice as long as wide, the anterior medians near the middle of the quadrangle, with their centres in a line with the inner edge of the posterior medians.

Vulva consisting of a subquadrate plate flanked on each side by an S-shaped sclerite, and with its anterior border deeply emarginate.

Measurements in millimetres.—Total length 13; carapace 4; first leg 18, fourth leg 17.

Loc. Grahamstown (*Dr. Schönland*).

Distinguished from *S. lineata*, Poc., from Durban (Ann. & Mag. Nat. Hist. (7) ii. p. 215, 1898), by having the anterior lateral eyes two diameters instead of one diameter apart, the anterior medians about a diameter instead of half a diameter apart, and only equal to the radius of the posterior medians, &c. (see Pl. III. fig. 5).

The genus *Spencerella* is very nearly related to *Maypacius* of Simon, which has representatives in tropical Africa and Madagascar; but, according to Simon's description of *Maypacius*, its species differ from those of *Spencerella* in having only *two* instead of *three* teeth on the posterior border of the fang-groove. *Maypacius* has two months' priority over *Spencerella*.

Euprosthenops pulchellus, sp. n.

(Pl. III. figs. 6, 6 *a*.)

Colour.—Integument of carapace deep brown, clothed with olive-black hairs, ornamented on each side with a narrow white stripe separated from the margin by a dark band exceeding it in width; cephalic region with a thin median stripe extending from between the posterior median eyes and a curved white line passing from the tubercles over the anterior median eyes; clypeus yellow, clothed with snow-white hairs; mandibles also yellow, naked below, and clothed externally and above with snow-white hairs; palpi and legs yellowish brown, clothed with a mixture of yellowish-brown and whitish hairs; coxæ yellow, spotted, clothed with white hairs like the sternum, which is black with a large pale median spot; abdomen blackish above, clothed with dark olive hairs, the dark field relieved by a thin median and a marginal silvery sinuous line; sides of abdomen blackish and silvery, lower surface pale, silvered, with two indistinct yellow bands.

Eyes of ocular quadrangle subequal, the quadrangle very noticeably longer than broad, the posterior eyes more, the anterior less, than a diameter apart, the posterior twice their diameter from the tubercle of the posterior lateral eye; quadrangle formed by the four posterior eyes not much wider behind than it is long.

Measurements in millimetres.—Total length 11; carapace 5; first and second legs 20, third 18, fourth 24.

Loc. Tea Fountain, near Grahamstown (*Miss Leppan*, type); Graaf Reinet (*Miss Leppan*).

Apart from the difference in colour and the form of the vulva, this species is easily distinguishable from *E. australis*, Sim. In the latter the eyes of the ocular quadrangle are very unequal; the ocular quadrangle is a little longer than wide, much narrowed in front, its anterior width being about half its posterior width; the anterior median eyes are much smaller than the posterior medians; posterior median eyes less than a diameter apart and about the same distance from the base of the tubercle of the posterior lateral eyes; quadrangle formed by the four posterior eyes about twice as wide as long, &c. Total length of adult female 24 millim.; carapace 9; fourth leg 50.

Family **Palpimanidæ**.

Palpimanus Leppanæ, sp. n.

♀.—At once distinguishable from the rest of the South-African species by the arrangement of the eyes; the posterior line is straight and lies far back, the posterior medians are about five or six diameters apart, the distance between them is about two thirds the distance between either and the posterior laterals of the same side; median quadrangle very narrowed in front, very long, considerably more than twice as long as its posterior width and more than four times its anterior width. Eyes of anterior line close-set, procurved, lower edge of medians only a little higher than upper edge of laterals, which are much smaller; clypeus low, only about equal to the height of the quadrangle formed by the eyes of the anterior line, the laterals of which are about twice their diameter above it.

Length 7 millim.

Loc. Jansenville (*Miss Leppan*).

Family **Drassidæ.**

Platyoides pictus, sp. n. (Pl. III. fig. 7.)

♀.—Carapace and mandibles almost coral-red or pale yellow in the young; legs pale brownish red or yellow; abdomen ashy white, the upperside with a broad marginal black band and a median black, anteriorly bifurcating stripe; sternum with a dark marginal band.

Anterior median *eyes* a little larger than the laterals, slightly more than a diameter apart, a little nearer to each other than either is to the lateral; posterior medians large, larger than the anterior medians, elliptical, a little more than their long diameter apart, about twice as far from the posterior laterals as from each other.

Mandible with tooth below.

Legs without spines or long hairs; tarsi and protarsi lightly scopulate.

Horny plate of *vulva* impressed with a pair of semioval pits, opening behind and separated in front by a V-shaped process; between the lateral lobes of the vulva a somewhat tongue-shaped sclerite is traceable.

Total length 8 millim.; length of carapace 3, width 2·5.

Loc. Tea Fountain, near Grahamstown, Cape Colony (*Miss Leppan*).

Platyoides Leppanæ, sp. n. (Pl. III. fig. 8.)

♀.—*Colour.* Carapace and mandibles deep blackish brown; legs testaceous, infuscate beneath and at extremities; sternum reddish brown, with a black rim; abdomen ashy or creamy white in alcohol, with a broad marginal black band and a median, posteriorly narrowing, black stripe.

Eyes of the anterior line subequal, medians barely a diameter apart and about three diameters from the laterals; posterior medians small, smaller than anterior medians, about four diameters apart and nearly six diameters from the posterior laterals.

Mandibles armed below with two strongish teeth.

Legs bristly, more thickly hairy distally, the tarsi and protarsi of the anterior pairs lightly scopulate beneath, the bristles on the base of the legs on the upperside spiniform.

Area of *vulva* with a median T-shaped horny plate, the upright of the T pointed at the bottom, each half of the crossbar lightly arched and curled backwards at the extremity, circumscribing a shallow, irregularly transversely oval depression.

♂.—Like the female in colour. Legs longer. Palpus with patella and tibia short; tarsus large and inflated, furnished with a long filiform flagellum and below with a forwardly-directed spine ending in a small apical hook.

Measurements in millimetres.— ♀. Total length 11·5; length of carapace 4·5, width 3·8; first leg 12·5, second 15, third 13, fourth 14.

♂. Length of carapace 3·5; length of first leg 14, of second 16, of third 13, of fourth 14·5.

Loc. Tea Fountain, near Grahamstown (*Miss Leppan*).

Differs from the foregoing and from *P. laterigradus* and *pusillus* in colour, in having two mandibular teeth, and in the form of the vulva.

Apart from their coloration, the four South-African species of this genus known to me may be distinguished as follows:—

a. Legs very smooth, without bristles or long hairs, clothed with short downy hair; protarsi and tarsi of first and second pairs with scopula of clavate hairs.......... *pictus*, sp. n.
b. Legs furnished with long bristles.
  *a*². Eyes of anterior line not very unequally spaced, distance between median and lateral a little more than the diameter of the median; tibia and protarsus of first leg spined below................. *pusillus*, Poc.
  *b*². Eyes of anterior line very unequally spaced, distance between median and lateral at least twice the diameter of the median; no spines, only bristles on the tibia and protarsus of first leg.
    *a*³. Tibia and protarsus of first and second leg with short scopula of clavate bristles; distance between median and lateral eye on each side about twice the diameter of the median* .... *laterigradus*, [Poc.
    *b*³. Tibia and protarsus of first and second leg without scopula; distance between median and lateral eye on each side about three times the diameter of the median........... .... *Leppanæ*, [sp. n.

Family Heteropodidæ.

Selenops Marshalli, sp. n. (Pl. II. fig. 6.)

♂.—*Colour.* Integument ochre-brown, covered with a mixture of golden-yellow and blackish hairs; legs mixed with blackish.

Eyes as in *S. atomarius* and *Spenceri*; those of the median quadrangle strongly recurved, the posterior medians twice the diameter of the anterior medians, with their lower edges only a little lower than the upper edges of the anterior medians, the latter equidistant from each other and from the edge of the clypeus, *i. e.* a little more than their own radius; anterior lateral standing high above the edge of the clypeus, about on a level with the lower border of the posterior medians.

Tibiæ of first and second *legs* with seven pairs of inferior spines, protarsi with three pairs.

Palp with its tibia armed with four apophyses—one inferior, large, and irregularly quadrate; one projecting externally almost at right angles and somewhat conical in shape; and two much thinner and somewhat spiniform, which run forwards to abut against the outer side of the base of the tarsus—of these the outer is blade-like, straighter and shorter, being a little more than half the length of the inner, which is sinuous and upcurled apically; to abut against its upcurled apical portion the tarsus is furnished externally and basally with a distinct angular prominence.

Measurements in millimetres.—Total length 11; length of carapace 5·5, of first leg 26, of second 28·5, of third 30.

Loc. Estcourt (4000 feet), in Natal (*G. A. K. Marshall*).

Selenops Whiteæ, sp. n. (Pl. II. fig. 7.)

♂.—Nearly allied to the foregoing, but distinguishable by the structure of the palpal spurs &c. The lower tibial apophysis has a much wider and deeper notch on its outer side near the base, and its distal edge, instead of being straight and transverse as in *S. Marshalli*, is more oblique, the whole apophysis being longer than in that species; the external apophysis, moreover, has its apex not curved downwards and forwards, but directed straight externally; of the two forwardly-directed apophyses the outer is thinner, more cylindrical, and less blade-like than in *S. Marshalli*, while the inner has its upper margin convex in its basal half and concave in the distal, not evenly concave throughout as in *S. Marshalli*; and, lastly, in *S. Whiteæ* there is no angular prominence on the base of the tarsus, only a small excrescence.

Measurements in millimetres.—Total length 12; carapace 5·5; first leg 29, second leg 30, third leg 32, fourth leg 36·5.

Loc. Brak Kloof, near Grahamstown (*Mrs. White*).

Selenops Schönlandi, sp. n. (Pl. III. fig. 15.)

Resembling *S. atomarius*, Sim., in having five pairs of inferior tibial spines on the first and second pairs of legs[*], but much larger and with the eyes of the median quadrangle less strongly recurved, the posterior medians one fourth larger than the anterior medians, standing less than their own diameter above the clypeus, with their lower edge about on a level with the centres of the latter; the distance between the anterior medians a little greater than their radius and a little greater than the distance between the anterior and posterior medians.

Vulva consisting of a horny plate, marked on each side posteriorly with a crest twisted like a ram's horn, and separated by a median quadrate area which anteriorly expands and is furnished with a right and left anguliform prominence. In *atomarius* the crests are sinuous or lightly sigmoid, without the strong ram's-horn curvature.

Total length 16 millim.; carapace 6·5.

Hab. Cape Colony, Jansenville (*Dr. Schönland*, type) and Pearston (*Dr. Broom*); Graaf Reinet (*Miss Leppan*).

The British Museum has examples of *S. atomarius* from Port Elizabeth (*H. A. Spencer* and *Dr. Broom*) and from Brak Kloof, Grahamstown (*Mrs. White*).

The African species of *Selenops* occurring south of the Zambesi may be grouped as follows by the spine-armature of their anterior legs:—

A. Protarsi of first and second legs with 2 pairs of spines; tibiæ with 8 pairs	*radiatus*, Latr.
B. Protarsi of first and second legs with 3 pairs of spines.	
a. Tibiæ of first and second legs with 4 pairs of spines	*parvulus*, Poc.
b. Tibiæ of first and second legs with 5 pairs of spines	*atomarius*, Sim.; *Broomi*, Poc.; *Schonlandi*, sp. n.

---

[*] In Ann. & Mag. Nat. Hist. (7) vii. p. 288 (1901), I forgetfully assigned seven pairs of tibial spines to *S. atomarius* in comparing it with *S. basutus*.

c. Tibiæ of first and second legs with 6 pairs of spines	*Kraussi*, Poc.
d. Tibiæ of first and second legs with 7 pairs of spines	*Spenceri*, Poc.; *basutus*, Poc; *Marshalli*, sp. n.; *Whiteæ*, sp. n.

Palystes Leppanæ, sp. n. (Pl. III. fig. 9.)

Dorsal integument palely castaneous, covered with hairs of a greyish-olive hue, with silky lustre, darker on the abdomen and mixed with white spots and blackish lines; clypeus with a yellow band; mandible with two similarly coloured bands above; sternum and coxæ clothed with bright golden-yellow hairs, the former with a pair of mesially interrupted transverse dark stripes; femora covered with olive-yellow hairs, speckled with clear yellow spots; patella yellowish white below; tibia with two yellowish-white and two black bands; abdomen with epigastric area covered with clear yellow hairs, a transverse black crescentic band behind the fold, and the rest of its area covered with a rich umber-red, mottled with numerous small yellow spots.

Vulva of the same type as that of *P. perornatus* (see Pl. III. fig. 10), but with the median sclerite heart-shaped, as wide as long, rounded laterally, bluntly pointed behind and stalked in front.

Total length 24 millim.; carapace 12; first leg 44, fourth 41.

Loc. Tea Fountain, near Grahamstown (*Miss Leppan*).

Belonging to the same category as *P. perornatus*, Poc. (Ann. & Mag. Nat. Hist. (7) vi. p. 331, 1900), but differing in the structure of the vulva and slightly in colouring, the white spots on the underside of the femora and abdomen being smaller and more numerous.

These two species and *lunatus*, Poc. (Ann. & Mag. Nat. Hist. (6) xvii. p. 60, pl. viii. fig. 5, 1896), which are evidently nearly related, to judge by the form of the vulva, may be distinguished as follows:—

a. Sternum with two bands; femora unspotted; median lobe of vulva very long	*lunatus*, Poc.
b. Sternum with a single anterior band; femora richly spotted with white; median lobe of vulva short.	
*a*¹. Median lobe of vulva longer than wide, its sides straight; spots on abdominal femora fewer	*perornatus*, Poc
*b*¹. Median lobe of vulva as wide as long, heart-shaped, with rounded sides	*Leppanæ*, sp. n.

Palystes Whiteæ, sp. n. (Pl. III. fig. 11.)

♂.—Upperside of carapace and abdomen mottled with yellowish and brown hairs, the abdomen with a median, posteriorly obsolete, laterally angular band; some white hairs above the anterior eyes, no white clypeal band below them; mandibles black, without white bands, clothed with long greyish-yellow hairs above; upperside of appendages matching the carapace in tint; mouth-parts black; sternum black, with posterior angle pale; coxæ of legs yellowish red, spotted with black; femora olive, spotted with paler yellow and with an apical blood-red patch; patella white; tibia with a median and distal white band, for the rest black; scopulæ dusky olive-grey; lower side of abdomen pinkish yellow, marbled with black; a black patch in front of spinners.

Eyes of posterior line slightly recurved, of the anterior line straight by their centres, the medians about half the diameter of the laterals.

Palp with two tibial spurs, as in *P. cultrifer* (see Pl. III. figs. 12 & 12 *a*), one being external, just behind the middle, and quadrate in shape, the other distal, but short, stoutish, directed forwards with a slight upward inclination and a lightly hooked extremity; palpal organ furnished with two short processes running straight forwards from the bulb—an outer (the spine), stout, apically pointed, and hooked; the inner (the conductor) membranous, with an expanded, horny, flattened extremity.

Total length 15 millim.; carapace 8·5.

Loc. Blak Kloof, near Grahamstown (*Mrs. White*).

This species is nearly allied to *P. cultrifer*, Poc., and *P. lycosinus*, Poc (Ann. & Mag. Nat. Hist. (7) vi. pp. 330–331, 1900), the three resembling each other in colour, except that in *P. Whiteæ* there is no black band behind the epigastric fold as in the other two, and there is a blood-red patch on the apex of the femora. Further approaching *cultrifer* in having two tibial spurs on the palpus of the male, but the posterior is short and quadrate, the distal also short and but little upcurled. Again, in *P. cultrifer* the style of the palpal organ is short and pointed, while the conductor is horny throughout, black, and hollowed.

Palystes scutatus, sp. n. (Pl. III. fig. 13.)

♀.—Resembling *Palystes distictus*, Poc., in colour. Posterior median *eyes* about a diameter and a half apart, a little further away from the laterals, the eyes of this line recurved, the centres of the laterals about on a level with the posterior edge of the medians, subequal; eyes of anterior line straight by their inferior edges, the laterals one fourth longer than the medians; quadrangle scarcely narrowed in front, a little longer than wide.

Vulva smaller than that of *P. distictus*, formed of a horseshoe-shaped sclerite, with a median piece wedged in between the two arms and filling the posterior half of its space, the anterior half being left empty and semilunar in shape.

Measurements in millimetres.—Total length 13; length ot carapace 7, of first leg 26, of fourth leg 25.

Loc. Brak Kloof, Grahamstown (*Mrs. White*).

Neither of these species falls, strictly speaking, into the genus *Palystes*, and it is probable that they will have to constitute a separate genus by themselves. The eyes of the posterior line are distinctly recurved; the ocular quadrangle is only a little longer than wide and only a little wider behind than in front; the posterior lateral eyes are not elevated and the anterior lateral eyes are only a little larger than the anterior medians, which are as large as the posterior medians. There is, however, considerable variation in the eyes in the various species referred to this genus. The colouring, again, of the two known species is quite unlike that of all the South-African *Palystes*. The latter apparently may be grouped as follows:—

1. *P. castaneus*, *lycosinus*, *cultrifer*, *Whiteæ*, *megacephalus*, *Chaperi*.
2. *P. lunatus*, *perornatus*, *Leppanæ*.
3. *P. natalius* (=*Spenceri*), *Ellioti*, *Johnstoni*, *Höhneli*, *Fornasinii*.
4. *P. distictus*, *scutatus*.

Sparassus fonticola, sp. n. (Pl. III. fig. 14.)

Colour. Integument of the cephalothorax, jaws, and limbs reddish yellow, scantily clothed with pale hairs; abdomen greyish yellow, faintly mottled.

Carapace as wide as long, a little shorter than patella + tibia of fourth leg and than tibia of second, and about equal to patella + tibia of third. Eyes of posterior line subequally spaced, scarcely procurved, laterals a little larger; medians about four diameters apart; quadrangle wider than long, narrowed in front; anterior medians larger than posterior medians; eyes of anterior line straight by their centres, subequally spaced; medians larger than laterals, a little more than a diameter apart.

Legs 2, 1, 4, 3 in length; patellæ unspined; tibia of third with 1 superior subdistal spine, tibia of first and second pairs with 2+2 inferior spines; no apical pair of spines.

Vulva very large, consisting of a long cavity, open behind, with parallel sides, and an expanded and semicircularly rounded anterior extremity; this cavity is filled by a median flat sclerite with slightly expanded and rounded anterior extremity, parallel sides, and a truncate posterior extremity bearing a median tubercular prominence.

Total length 7 millim.; length and width of carapace 4; length of first leg 14·5, of second 16·5, of third 11, of fourth 13.

Loc. Tea Fountain, near Grahamstown (*Miss Leppan*).

EXPLANATION OF THE PLATES.

Plate II.

Fig. 1. Outer view of right mandible of *Dæsia bellula*, the form of the flagellum shown in outline.
Fig. 1 *a.* Apex of upper jaw of the same from beneath.
Fig. 2. Outer view of right mandible of *Ceroma pictulum*; flagellum cut short, its proximal end shown in outline.
Fig. 3. Outer view of jaws of *Broomiella lineata.*
Fig. 3 *a.* Inner view of upper jaw of same, to show flagellum.
Fig. 3 *b.* Tarsi of third and fourth legs of the same.
Fig. 4. Right palp of *Stasimopus palpiger*, ♂.
Fig. 4 *a.* Distal end of the same.
Fig. 5. Outer view of tibia and tarsus of right palp of *Acanthodon ochreolum.*
Fig. 5 *a.* Distal end of tibia and proximal end of protarsus of first leg of the same.
Fig. 6. Outer view of tibia of palp of *Selenops Marshalli*, ♂.
Fig. 7. Outer view of tibia of palp of *Selenops Whiteæ*, ♂.

Plate III.

Fig. 1. *Thalassius Rossii*, sp. n. Vulva.
Fig. 2. *Rothus lineatus*, sp. n. Vulva.
Fig. 3. *Rothus auratus*, Poc. Vulva.
Fig. 4. *Spencerella signata*, sp. n. Vulva.
Fig. 4 *a.* Ditto. Eyes represented in a horizontal plane.
Fig. 5. *Spencerella lineata*, Poc. Eyes represented in a horizontal plane.
Fig. 6. *Euprosthenops pulchellus*, sp. n. Vulva.
Fig. 6 *a.* Ditto. Eyes represented in a horizontal plane.
Fig. 7. *Platyoides pictus*, sp. n. Vulva.
Fig. 8. *Platyoides Leppanæ*, sp. n. Vulva.
Fig. 9. *Palystes Leppanæ*, sp. n. Vulva.
Fig. 10. *Palystes perornatus*, sp. n. Vulva.
Fig. 11. *Palystes Whiteæ*, sp. n. Outer view of tibia of palp of ♂.
Fig. 12. *Palystes cultrifer*, Poc. Outer view of tibia of palp of ♂.
Fig. 12 *a.* Ditto. Vulva.
Fig. 13. *Palystes scutatus*, sp. n. Vulva.
Fig. 14. *Sparassus fonticola*, sp. n. Vulva.
Fig. 15. *Selenops Schonlandi*, sp. n. Vulva.

NOTE.

During the passage of this paper through the press I received a small consignment of Arachnida from Mr. Richard Crawshay, who collected them in Basutoland. Amongst them were two examples of a new species of *Palystes* which may be diagnosed as follows:—

Palystes Crawshayi, sp. n.

♀.—Colour of dorsal surface a fairly uniform greyish brown, obscurely mottled like the back of tarsi; pale clypeal band on base and two superior external pale bands on mandible; sternum yellow, with two black bands; coxæ yellow; femora greyish black below, conspicuously spotted with yellowish grey; epigastric area yellow; a transverse black band behind the epigastric fold, the rest of the lower surface dark red variegated with white spots.

Vulva with a deep and wide excavation, which is almost as wide as long, with its lateral margins converging and almost meeting in the posterior middle line; the anterior half of the space occupied by a skeletal piece, which is irregularly transversely oblong in shape and attached by a narrow "stalk" running from the middle of its anterior border to the adjacent anterior rim of the excavation, and laterally by a membranous piece to the anterior part of the lateral rim.

Total length 25 millim.; length of carapace 11.

Loc. Maseru, in Basutoland.

Closely allied in colouring &c. to *P. lunatus*, *perornatus*, and *Leppanæ* (see p. 23, *antea*), but differing in the form of the median sclerite of the vulva, which has its posterior border transverse and not produced. It resembles *lunatus* in the presence of two sternal bands and the other two in the spotting of the femora.

III.—*Notes on some Recent Publications concerning Diatoms.*

By P. T. CLEVE and C. MERESCHKOWSKY.

1. G. KARSTEN. "Die Diatomeen der Kieler Bucht." Wissenschaftliche Meeresuntersuchungen herausgegeben von der Kommission in Kiel: 1889, 4to.

This in many respects important publication will no doubt be for a long time a *vade mecum* for all students of living diatoms. The observations of the author concerning the formation of auxospores cannot be overestimated, and the number of interesting and, in the great majority of cases, correctly described facts concerning the cell-contents of the diatoms surpasses all that has been done before.

It is the recognition of the great value of this work and the desire to render it still more valuable and useful, not for finding errors, that has induced us to undertake the publication of the following critical remarks. Mistakes are inevitable in a work of such great extent and on a subject so delicate and so full of difficulties. We believe therefore that our criticism, undertaken in a friendly spirit and for the sake of truth only, will by no means wound the feelings of the author.

One of us (Cleve) will endeavour to correct as far as possible the errors in the determination of species, the other will deal more particularly with the cell-contents.

February 5, 1902.

A. *Notes by* P. T. Cleve.

Asterionella Bleakeleyi (p. 2[illegible]) is a tropical species. The specimens figured agree with *Diatoma tenue*, Ag., a common freshwater form frequently occurring in slightly brackish water.

Navicula retusa (p. 47).—The figure shows that the median striæ are alternately longer and shorter, a characteristic that does not belong to the named species. Doubtless *Navicula digito-radiata* (var. *cyprinus*).

Navicula subtilis (p. 53) does not represent Gregory's species, but rather *Navicula cincta.*

Navicula ammophila var. **lata** (p. 54) is too large to be a form of *N. ammophila.*

Navicula neglecta (p. 57) is said to be akin to *N. formosa*, but I have never met with so coarsely striate a form (striæ 6–7 in 0·01 mm.).

Navicula latissima var. **constricta** (p. 57) is a form of *N. humerosa.*

Navicula pygmæa (p. 59) = *N. forcipata*, Grev.

Navicula Græffii (p. 60) seems to represent a form of *Diploneis fusca.* Grunow's *N. Græffii* occurs in tropical seas only.

Navicula interrupta (p. 61) probably represents a form of *Diploneis splendida* or *D. bombus. D. interrupta* has no striæ or only faint ones in the central part, and has besides a different outline.

Navicula musca (p. 61) does not represent Gregory's species, which is altogether different, but *Diploneis didyma*, Ehb.

Navicula aucklandica (p. 66): doubtless not Grunow's species; indeterminable.

Navicula forcipata, Grev., var.? (p. 67), seems not to differ from *N. abrupta*, Greg.

Navicula H (p. 68) is nothing but a form of *N. lyra*, Ehb.

Trachyneis velata, A. S., var.? (p. 70). As this species has been noted from the Southern Hemisphere only (Cape of Good Hope, Cape Horn, Ascension), its occurrence in "Kieler Bucht" seems to be very doubtful. Probably *T. aspera*, var. *pulchella*.

Pleurosigma marinum (p. 78) does not represent Donkin's species, which has an altogether different median line. The outline reminds one of *P. Normanii*, Ralfs, but the central striation and, according to M. Mereschkowsky, the chromatophores are different.

Pleurosigma compactum (p. 86): probably *Gyrosigma arcticum*, Cl.

Donkinia baltica (pp. 85, 86): probably *Gyrosigma compactum*.

Amphiprora incisa (p. 90) = *A. duplex*, Greg.

Mastogloia Smithii (p. 92).—The right figure does not represent the species of Thwaites, but rather *M. lanceolata*. The striæ are, however, radiate throughout, in which characteristic it resembles *M. elliptica*, Ag.; but the median striæ of the latter species are different.

Cocconeis placentula (p. 94) seems to be a small form of *C. scutellum*.

Cocconeis apiculata (p. 94) seems not to agree sufficiently with A. Schmidt's figure (from Cape of Good Hope). [I have once found in plankton from Skagen a diatom the lower valve of which agreed with fig. 117, but the upper valve was identical with Grunow's *Schizostauron Reichardtianum*, which thus belongs to *Achnanthes*, s. l. Another species, hitherto regarded as a *Navicula*, viz. *Stauroneis obliqua*, has also dissimilar valves, and is most akin to *Cocconeis flexella*, Kütz., =*Achnanthidium flexellum*.]

Amphora alpha (p. 106) is doubtful; possibly a form of *A. quadrata* (Greg.?), Perag.

Amphora beta (p. 107): doubtful; possibly *A. sulcata* (Bréb.?), Perag.

Amphora gamma (p. 108) = "*Hantzschia*" *marina* (Donk.).

Amphora delta (p. 108) seems to be akin to *A. alata*, Perag.

Amphora zeta (p. 109): doubtful; perhaps *A. lævis*, var. *minuta*, Cl.

Amphora ostrearia (p. 111) certainly does not represent this well-known species, but possibly *A. commutata*, Grun.

Auricula punctata (p. 115) can scarcely be specifically distinct from *A. insecta*.

Auricula staurophora (p. 117) is no doubt the same form as *Amphora quadrata* (Bréb.), Cl.

Nitzschia dubia (p. 122): too coarsely striate (striæ 12–13 in 0·01 mm.) to be the species of W. Smith (striæ about 23 in 0 01 mm.).

Nitzschia valida (p. 127): probably *N. sigma*. The true *N. valida* occurs in warmer seas only.

Campylodiscus parvulus (p. 132) = *C. Thureti*, Bréb. There can scarcely be any doubt that *C. parvulus*, W. Sm. = *C. Thureti*, Bréb., and that *C. parvulus*, Van Heurck, Syn. (lxxvii. 2), represents another species akin to *C. Lorenzianus*, Grun.

B. *Notes by* C. MERESCHKOWSKY.

Fragilaria striatula, Lyngb. (p. 23),

has, according to Karsten, a single plate (he expresses, however, some doubt about it). The var. *californica*, Grun., has four plates; it seems most probable that the type also possesses the same number of chromatophores. Also *F. hyalina* has four plates. I doubt whether *F. crotonensis* (A. M.-Edw.), Kitt. p. 24, has only one plate.

Synedra sp. (**Hennedyana?**) (p. 27)

is doubtless nothing but *Cylindrotheca gracilis* (Bréb.), Grun. See C. Mereschkowsky, "A List of Californian

Diatoms," Ann. & Mag. Nat. Hist. 1901, vol. vii. pl iv. fig. 21.

Achnanthes brevipes and **A. subsessilis** (p. 43).

All true *Achnanthidia* have four plates united into pairs by a common pyrenoid. This is also correctly represented in Karsten's figures of both species, and in the description given in the general part (p. 161) he mentions four-plates; but when on p. 42 he says "Zwei Chromatophoren beiderseits des centralen Kern," this can easily be misunderstood. We differ, however, in one respect; according to Karsten the two opposite plates are united by a transverse band of endochrome, while in my figures (Et. sur l'Endochrome des Diat. pl. vi. figs. 20, 22) no such band exists, the two plates being united by a colourless body. I have been criticized by Karsten for calling it (as well as similar bodies in *Okedenia inflexa* and *O. pontica*) a pyrenoid. Indeed, a colourless pyrenoid seems to be a contradiction in itself, as, according to the generally accepted opinion, a pyrenoid is a body colourless by itself, but being enclosed in the very substance of the endochrome has theretore necessarily a coloured appearance. This, however, is not quite correct. The pyrenoid can emerge from the chromatophore either partly (*Mastogloia*, *Achnanthidium*) or even entirely. We find all three cases occurring sometimes in the same genus: coloured common pyrenoids [*Achnanthidium* (*Cymbosira*) *Agardhii* (Kütz.)], partly out of the endochrome (*A.* sp.), and completely free (*A. glabratum*). To this latter type also *A. brevipes*, at least its var. *intermedia*, seems to belong. I intend to return to this interesting subject in a special note.

Navicula dicephala, W. Sm. (p. 51),

cannot be this species, as *N. dicephala* has the same endochrome as *Cymbella* (one plate), and therefore does not belong even to the family Naviculaceæ.

Navicula mollis (W. S.), Cl. (p. 55, fig. 51).

The third figure (next to the margin) is most probably a *Libellus*.

Navicula humerosa, Bréb. (p. 56).

Fig. 55 represents either a stage of division or else it is an error, this species having normally two plates along the valves (see Et. s. l'End. d. Diat. pl. ii. fig. 6); this is exactly reproduced in fig. 56, representing, according to Cleve, a form of *N. humerosa*. In a letter Karsten expresses his opinion that the diatoms which we have both studied, although very similar in their general appearance, may belong to two quite different species. This may indeed be the case, and we see a beautiful example of it in *N. scopulorum*; but in the present instance such a supposition seems to be very improbable.

Navicula didyma, Ehr. (*N. bombus*, Ehr.) (p. 62, fig. 66).

All the four figures belong to *Diploneis didyma*, but fig. 67, *a* 1, is certainly not this species. The cell-contents differ somewhat from what I have observed in California; the margins of the plates do not join so closely, leaving a broad space in the middle part of the valve; they are more finely and regularly indented. Four central plæoplasts of a very peculiar appearance and two libroplasts * are, of course, not mentioned, as Karsten seems to attribute to them no importance whatever.

Navicula scopulorum, Bréb. (pp. 63, 64).

The descriptions of the endochrome of this species given by Karsten and myself differ in every respect. There can be no doubt as to the correctness of Karsten's observations, the more so as they fully agree with those of Paul Petit and Brébisson; neither can my observations be doubted, as they are corroborated by the var. *fasciculata*, Gr., which has the same endochrome †. The only possible conclusion is this: there exist two very different diatoms, belonging to two widely separated families (Naviculaceæ and Okedenieæ), which are identical as regards the structure of their frustules and valves (see also *Nitzschia angularis*).

Navicula (Libellus) constricta, W. Sm. (p. 65).

Is not the type species, but the var. *linearis*, Mer.‡ Does certainly not belong to the genus *Navicula*, but represents rather a new genus (*Stauronella*).

Pleurosigma fasciola, W. Sm. (p. 74).

I have observed hundreds of living specimens of this species in the Mediterranean, in the Pacific Ocean, and in fresh water (California), and I never saw a single individual with four plates. There are always two plates, as in all species of the genus *Gyrosigma*, s. s.

Pleurosigma tenuissimum, W. Sm. (pp. 75, 76).

The above remark applies to this species also: there are invariably only two plates, which are *always* disposed very asymmetrically—that is to say, if the left plate is nearer to the upper end of the frustule, the right one is nearer to the lower end. This is a very characteristic and constant feature of *Gyrosigma tenuissimum.*

---

* See for these terms my paper "On *Sellaphora*," Ann. & Mag. Nat. Hist., Mar. 1902, p. 187.

† C. Mereschkowsky, "On *Okedenia*," Ann. & Mag. Nat. Hist. 1901, vol. viii. pl. vii. figs. 7, 8.

‡ C. Mereschkowsky, "On *Stauronella*, a new Genus of Diatoms," Ann. & Mag. Nat. Hist. 1901, vol. viii. p. 424.

Pleurosigma nubecula, W. Sm. (p. 77, fig. 88).

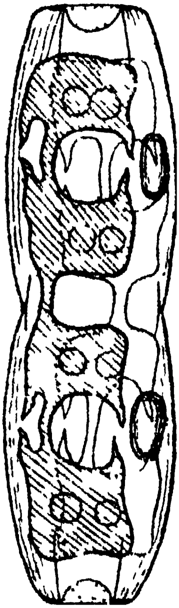
The left figure is too sigmoidal to belong to this species; it seems rather to represent a small individual of *P. delicatulum*, of which it has the endochrome. The right figure might be *P. nubecula* but for the endochrome, which, according to my observations, is of the same type as in *P. Normanii* (Et. s. l'End. d. D pl. iv. figs. 1–5).

Scoliopleura latestriata, Grun. (p. 81) [its right name is *Scoliotropis latestriata* (Bréb.), Cl.].

In the var. *amphora* the two opposite plates are united by a *common* pyrenoid. It is very likely to be the same in the type species also. Karsten represents them as being separated.

Tropidoneis maxima, Greg., var.? (p. 88).

Represents two species; the second figure (from the left)



Tropidoneis vitrea, W. Sm., with cell-contents. $\frac{900}{1}$.

is probably *T. tetraplasta*, a new species, characterized by the presence of four libroplasts instead of two, as is usually the case. The third figure is doubtless the *T. vitrea*, but the description of the endochrome is erroneous; there are two plates, it is true, but they extend all along the connectives, being composed of an upper and a lower part, uniting in the middle by a very narrow band. As the same error has been committed by Pfitzer, I give here a figure (p. 33) of the endochrome of this species. The two elongated bodies on the right side represent the two libroplasts, so characteristic for the whole genus.

Mastogloia Smithii, Thor. (p. 92).

Here, again, the description of Karsten can easily mislead the reader, as was the case in regard to *Achnanthidium brevipes*. When he says "Zwei Chromatophoren sind vorhanden," this is certainly not correct. In a letter Professor Karsten explains that he means two pairs of chromatophores united by a common pyrenoid—which is correct, and agrees pretty well with the figures. But the species, as Cleve points out, is not *M. Smithii*, and cannot be the same on account of the position of the plates along the connectin very different from what Cleve and I h *M. Smithii*.

My recent observations on the structur *Mastogloia* have shown the descriptions and fi my 'Etudes sur l'Endochrome des Diatomé exact.

Cocconeis scutellum, Ehr. (p. 93).

The foramina in the chromatophore-plate a The margins in this species are sometimes deep and the lobes may come in contact, thus producing pseudo-foramina.

Amphora beta (p. 107).

This is no doubt the same species that I have desc Etudes s. l'End. pl. v. fig. 9. The endochrome is th the outlines of the frustule are the same, and as to the di of the zone Karsten says "Zonen mit punktirten Li I have but little doubt that this is the *A. composita* figured in A. S. Atlas, pl. xxvi. fig. 44, which I believ be a good species. According to Cleve, *A. beta* might re sent *A. sulcata* (Bréb.?), Per. (Diat. mar. d. Fr. pl. xl fig. 7), but the outlines of the frustules in both species ar little different and the size of the latter is smaller.

Amphora ehta (p. 109).

This is the same form that is figured in my Etudes sur l'End. pl. v. figs. 4, 5, representing most probably Gregory's *A. excisa.* I must have overlooked the pyrenoids.

Amphora ostrearia, Bréb. (p. 110).

I have the same doubt as Cleve concerning the correctness of the determination of this species; its endochrome, although of the same type as in *A. ostrearia*, has a different habitus from that of the latter species (see *A. teta*).

Amphora epsilon (p. 111).

A form with which I am well acquainted. It is *A. acuta*, var. *arcuata*, A. S., the same as in Etudes s. l'End. d. D. pl. vi. fig. 1. I can fully confirm the correctness of this determination.

Amphora teta (p. 112).

This is the genuine *A. ostrearia*; figure 149 represents the endochrome exactly as I have recently observed it in California, where this species is very common; the plates are large, with undulated and broadly indented margins.

Auricula punctata, Karst. (pp. 115, 116).

Is the same as *Auricula quadrangulata*, Mer. (Et. s. l'End. pl. vi. fig. 18). Seems to differ from *A. insecta*, to which it is nearly related, in the presence of puncta.

Auricula staurophora, Karst.

Same as the form described and figured in Et. s. l'End. pl. vi. fig. 14, under the name of *Amphora quadrata*, a name which seems to have lost all meaning because of the many and various forms to which it has been applied (see, for instance, Perag. D. mar. d. Fr. p. 220, pl. xlix. fig. 19). I do [illegible] believe, however, *A. staurophora* to be sufficiently distinct [illegible] *ula stauroneis*, Mer. (*l. c.* pl. vi. figs. 15, 16), to [illegible] good species; one of these should be considered [illegible] riety of the other. The granules are represented [illegible] er as being elliptical, which is to be attributed to [illegible] al not being in a sufficiently fresh condition. I also [illegible] describe the pyrenoids.

[illegible] **angularis**, W. Sm. (p. 120).

[illegible] different from the form I have described under this [illegible] (Et. s. l'End. pl. vii. figs. 1, 2). In California I have [illegible] rved quite a number of forms which could hardly be [illegible] rated from *N. distans*: at the same time their cell-contents are so different that they no doubt represent very distinct species. This would explain the difference in the present case, which is analogous to that of *Navicula scopulorum*.

But when Karsten describes the endochrome as being composed of a single plate he is certainly wrong. I have carefully studied over fifty species and varieties of *Nitzschia*, and I can positively affirm that there is not a single species of this genus which has less than two plates. All the statements to the contrary are positively erroneous. This error, introduced by Pfitzer, has since been frequently repeated with a remarkable persistency by Paul Petit, Van Heurck ('A Treat. on the Diat.' p. 382), &c., and now again by Karsten. There is no such thing as a single plate in the genus *Nitzschia*.

That is the reason why I do not believe the *Hantzschia marina*, which, according to Karsten (see *Amphora gamma*, p. 108), possesses a single plate, to be a *Hantzschia* or to belong to the Nitzschieæ at all. It is, in my opinion, nothing but an *Epithemia*, and therefore belongs to the Archaideæ *, which are usually characterized by a single plate (*Auricula*, *Amphiprora*). Its name should be changed into *Epithemia marina*.

Karsten also erroneously attributes one plate to *Nitzschia punctata*, var. *elongata* (p. 121), *N. litoralis* (p. 121), and *N. constricta* (p. 122).

Nitzschia lanceolata, W. Sm. (p. 129).

We somewhat disagree in regard to this species. One of us must have made an error in the determination, but I could not say positively whether it is Karsten or myself.

Surirella gemma, Ehr. (p. 131).

The figure is correct, but it is not quite exact to say that there are two plates. There is only a single plate, bent at the lower end, and it is only before the division of the frustule that the plate becomes divided.

2. C. Mereschkowsky. "Etudes sur l'Endochrome des Diatomées." I^e Partie. Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg, 1901, vol. xi. n. 6.

This paper contains a number of erroneous determinations, which would all have been corrected had I received the proofs. The most important are the following:—

---

* See my paper "On *Stauronella*," Ann. & Mag. Nat. Hist. vol. viii. p. 429.

Instead of	Read
Diploneis suborbicularis, Greg. (p. 5).	*Diploneis papula*, A. S.?
Caloneis formosa, var. *quadrilineata*, Gr (p. 6).	*Caloneis liber*, var *excentrica*, Grun.
Navicula (*Libellus*) species prima (p. 14).	*Libellus reticulatus*, Mer.
L'exactitude de la figure (p 15, line 11 from top).	L'exactitude de la figure 22 *b*.
N. 33. *Navicula* species? (p. 15).	*Neidium affine*, var. *amphirhynchus* (Ehr.).
Amphipleura micans, Lyngb. (p. 17).	*Navicula* (*Dickieia*) *oblita*, Mer.
Pleurosigma elongatum, W. Sm. (p 20).	*Pleurosigma delicatulum*, W. Sm.
Amphora acutiuscula, var. *subconstricta*, Gr.? (p. 26)	*Amphora angularis*, Greg.
Amphora angularis, Greg. (p. 26).	*Amphora alata*, var. *delta*, Karst.
Amphora Arcus, Greg ? (p 26).	*Amphora composita*, Jan.
Amphora lineolata, Ehr ? (p. 27).	*Amphora* species?
Amphora ocellata, Donk. (p. 28).	*A. quadrangulata*, Mer.
Nitzschia Acus, Cl. (p 35).	*Nitzschia seriata*, Cl.
Nitzschiella tenuirostris, var *genuina*, Mer. (p. 37).	*Nitzschiella tenuirostris*, var. *hamulifera*, Mer.

3. HEIDEN-ROSTOCK. "Diatomeen des Conventer Sees bei Doberan." Mitth. a. d. Meckb. Geol. Landesanstalt, x. num. 21. Rostock, 1900. 4to.

Amphora Geinitzi (fig. 1) = *A. arenicola*, Grun., var. *major*, Cl. Syn. Nav. D.

Mastogloia stauroneiformis, sp. n. (fig. 5) = *M. Smithii*, var. *lacustris*, Grun.

Mastogloia varieloculata, sp. n. (fig. 7): agrees with *M. Braunii*, Grun., but the striæ are stated to be 32 in 0·01 mm. (perhaps a misprint for 23).

Navicula alluviana, sp. n. (fig. 8) = *Pinnularia rectangulata*, Greg.?

Navicula conventus, sp. n. (fig. 9) = *N. directa*, var. *subtilis*, Greg. (in Cl. Syn. Navic. Diat. ii. p. 27, the length is given as 0·012 instead of 0·12 mm.).

Cocconeis lanceolata, sp. n. (fig. 17) = *C. quarnerensis*, Grun.

Nitzschia variepunctata, sp. n. (fig. 22) = *N. navicularis* (Bréb.), Grun.

P. T. C.

4. E. Schütt. "Centrifugale und simultane Membranverdickungen." Jahrb. f. wiss. Bot. xxxv. 3, 1900.

Guinardia baltica (figs. 11, 12) = *G. flaccida* (Castr.).

Leptocylindrus danicus (fig. 33) = *Rhizosolenia delicatula*, Cl. (K. Sv. Vet.-Akad. Handl. vol. xxxii. n. 8, 1900).

Rhizosolenia setigera (fig. 34) = *R. semispina*, Hensen.

Rhizosolenia Hensenii = *R. setigera*, Btw. P. T. C.

5. Schröder. "Das Phytoplankton des Golfes von Neapel." Mitth. aus der zool. Stat. zu Neapel, vol. xiv.

Asteromphalus Ralfsianus (fig. 7) seems to be a small form of *A. Hookeri*, but the fig. is not sufficient. It cannot represent *A. Ralfsianus* = *A. heptactis*, the central space being much too large.

Euodia arcuata, sp. n. (fig. 8) = *Hemidiscus cuneiformis*.
P. T. C.

IV.—*On the Genus* Latrodectus, *Walck.*

By Frederick Pickard Cambridge, B.A., F.Z.S.

In February 1902 a paper on this genus was read before the Zoological Society of London, and a table giving differential characters for the various species and subspecies was added.

While executing the plates for that paper it has become clear that certain characters, based on the clothing of the abdomen, are of greater importance than I had considered at the time to be the case, and I therefore publish the following table as affording a better key to the characters of the different species than that included in my paper read before the Zoological Society. These characters will all be found illustrated on the plates accompanying my paper in the 'Proceedings of the Zoological Society.'

Females.

A. Integument of abdomen, at any rate on the lateral area, clothed with minute acanthoid spines, with or without longer bristles or spines.
  i. Abdomen clothed on the lateral area with

minute acanthoid spines, densely on the sides, more sparsely above, variable in length, but without longer and stouter spines .... *pallidus*, O. P. Cambr.
ii. Abdomen furnished also with longer spines.
a. The additional spines short, straight, and very stout .... *hystrix*, E. Simon.
b. The additional spines longer and curved, usually bluntly pointed.
*a*¹. The additional spines longer, curved in every direction. Abdomen with red spots or entirely black .... *tredecim-guttatus*, Rossi.
*b*¹. The additional spines shorter, curved mainly in the same direction. The bands on abdomen never broken up into spots nor (so far as one may judge from material at hand) ever entirely black.
*a*². Dorsal apical red band on abdomen clothed with both acanthoid spines and longer spines ... . *Hasseltii*, Thor.
*b*². Dorsal band without acanthoid spines, bristles only.
*a*³. Bristles on dorsal band at least their own length apart ...... var. *indicus*, Simon.
*b*³. Bristles on dorsal band less than half their own length apart ... var. from Loyalty Is.
B. Integument of abdomen entirely devoid of acanthoid spines, clothed only with fine silky hairs (or, in *Menavodi*, bristles).
*a*⁴. Central anterior eyes not larger than the lateral anteriors.
1. Bristles on abdomen of two different lengths. Abdomen with three lateral spots on each side devoid of hair .... *Menavodi*, Vinson.
2. Bristles (or hairs) on abdomen of the same length. No lateral spots on abdomen.
*a**. Size larger .... *mactans*, Fabricius.
*b**. Size smaller.
1*a*. Legs much more slender. Femur iv. eight times its width ...... *geographicus*, Hasselt.
2*a*. Legs much stouter. Femur iv. five to six times its width ...... *katipo*, Powell.
*b*⁴. Central anterior eyes larger than the lateral anteriors .... *geometricus*, C. L. Koch

Since my former paper was read I have also received Dr. Dahl's publication on the members of this genus*. Whether the characters deduced from the differences in the hairs of the patella and tibia will bear the weight of importance laid upon them can only be judged by a comparative examination of a long series of examples. Species are separated, for instance, by the presence of several (six or seven) blunt bristles, or *at least one*, amongst many pointed bristles from those which possess *no* blunt bristle. If, however, they vary in this respect between six and one, there is no reason why they should not vary from six to *none*. So, too, with respect to colour-differences and characters based on the relative length of protarsus i., in connexion at any rate with the distinction of *L. geometricus* from *L. obscurior*, new species. In numerous examples of *L. geometricus* from the Amazons, Table Mountain, Karachi, and Jansenville one finds every variation in coloration from pale whity grey to almost jet-black, while protarsus i. varies in length from three to four times longer than the tarsus. *L. obscurior* is distinguished from *geometricus* by the variation of protarsus i., three and a quarter to three and a half times the tarsus—that of the latter species being *about four* times the tarsus.

---

* 'Sitzungs-Bericht der Gesellschaft naturforschender Freunde zu Berlin,' p. 40 (Feb. 18, 1902): "Uebersicht der *Latrodectus*-Arten," by Friedr. Dahl.

The variation of colour in *L. mactans*, too, ranges from the central band and lateral slashes being red (as in the typical North-American form) to almost jet-black, so that one hesitates to separate examples even as *subspecies* on the strength of slight variations in this respect—as, for instance, *L. insularis*, *L. insularis insularis*, and *L. insularis lunulifer*.

The following are Dr. Dahl's new species and subspecies:—*L. obscurior*, sp. n., Madagascar; *L. insularis*, sp. n., Antilles; *L. insularis insularis*, subsp. n., St. Thomas; *L. insularis lunulifer*, subsp. n., Haiti; *L. sagittifer*, sp. n., Porto Alegro; *L. ancorifer*, sp. n., New Guinea; *L. Hahli*, sp. n., Bismarck Archipelago; *L. luzonicus*, sp. n., Philippines; *L. Stuhlmanni*, sp. n., East Africa, *L. renivulvatus*, sp. n., German S.W. Africa.

V.—*Contributions from the New Mexico Biological Station.* —XIII. *On the Bees of the Family* Nomadidæ *of Ashmead.*

By T. D. A. Cockerell and Emerson Atkins.

The Nomadidæ of Ashmead (Trans. Am. Ent. Soc. xxvi. p. 64) are the parasitic bees with three submarginal cells. Ashmead himself says that they have "undoubtedly originated from other bees, through different lines of descent." He adds:—"It is evident, however, that most of them are descendants from various Anthophorid bees, since they agree more nearly with these bees in venation and the characters of the mouth-parts than with any of the others." If we admit that a valid taxonomic group must consist of forms not less related to one another than to forms outside of the group, or, at least, that the group must have a common ancestor exhibiting the group-characters, then the family Nomadidæ, by the admission of its author, is not valid, or else must be restricted to a small portion of the genera now included in it. In other words, convergent evolution must be distinguished from blood-relationship*.

In our studies of these bees we have met with facts which convince us that they are descended from two or three entirely diverse groups, *Nomada* itself coming from the Panurginæ.

NOMADA, Scopoli, 1770.

Mr. E. Saunders (Journ. Linn. Soc., Zool. xxiii. p. 423) says:—"This genus forms a curious transition between the Andrenidæ and Apidæ; it has many of the characteristics of the latter division, such as the long tongue, the acute paraglossæ, and the long basal joint of the labial palpi; on the other hand, however, it has the joints of the labial palpi subcylindrical, like the Andrenidæ, without any tendency to the flat or concave sheath-like form of the Apidæ, and its species are also parasitic on the Andrenidæ (with the exception of *N. sexfasciata*, which frequents the burrows of *Eucera*). . . . I should feel inclined to treat it as a very abnormal genus of the Andrenidæ."

When we come to compare the mouth-parts of *Nomada* with those of the Panurginæ (which are themselves obviously derived from the Andrenidæ) all the difficulties mentioned by Saunders disappear. In the Panurgine mouth we find the long tongue, the long basal joint of the labial palpus, and paraglossæ of the same type as *Nomada*. Moreover, certain species of *Nomada* (e. g. *N. similis*) are parasitic on *Panurgus*.

Of all the Panurginæ *Panurgus* is most like *Nomada*, having the same slender tapering galea, the same long maxillary palpi, &c. The greatest difference is in the paraglossæ, which in *Nomada* are much more slender; but another Panurgine bee, *Dufourea vulgaris*, has slender paraglossæ, as in *Nomada*, though it differs from *Nomada* in the palpi. *Nomada*, to be sure, has three submarginal cells in the wings, whereas the Panurginæ have but two; however, *Nomada obliterata*, Cresson, has constantly only two submarginals *, while a form of *Dufourea* (subg. *Trilia*, Vachal) has three. *Andrena* has usually three submarginals, but some species have only two.

---

* In the famous paper by De Vries (*cf.* 'Science,' May 9, 1902, p 726) new "species" are said to appear repeatedly among the offspring of *Œnothera* or *Onagra Lamarckiana* (apparently it should be *Onagra grandiflora*); thus the "species" *Œnothera oblonga* originated several hundred times independently. Of course the fact is that *Œ. Lamarckiana* is polymorphic, and the various mutations have not yet reached the status of species.—T. D. A. C.

As typical examples of *Nomada* we have studied *N. fucata*, Panz. (Mallorca, Balearic Is., from Friese), and *N. xanthophila*, Ckll. (New Mexico). In *Panurgus* we have used *P. calcaratus* and *P. Banksianus*.

Nomada modesta, Cresson (Las Vegas, N. M., collected by A. Garlick), differs from the other species by the very large and long galea (actually larger than in *N. xanthophila*, though the bee is smaller), shorter maxillary palpi (not much over half length of galea), very long paraglossæ, long tongue, and very long basal joint of labial palpi (much exceeding the other three joints together). In these characters (except the paraglossæ) *N. modesta* closely resembles *Calliopsis verbenæ* (also from Las Vegas, N. M.).

There is a singular resemblance in the mouth-parts between *Nomada* and *Exomalopsis*, but the bees are otherwise entirely different, and are evidently not related.

The following table gives the differential characters of the mouth-parts of several Panurgine bees, placing *Nomada* among them for purposes of comparison:—

A. Maxillary palpi far surpassing the galea †.
  a. First joint of labial palpi longer than the other three together; galea broad, not bristly .... *Halictoides dentiventris*, [Nyl.
  aa. First joint of labial palpi not longer than the other three together.
    b. First joint of labial palpi about equal with second; the first two joints very stout .... *Rhophitoides canus* [(Eversm.).
    bb. First joint of labial palpi conspicuously longer than second.
      c. Tongue very narrow, nearly parallel-sided; labial palpi long and slender; galea very slender apically, with bristles along its whole hind

---

* *Nomada obliterata* may stand as the type of a subgenus *Heminomada*.—T. D. A. C.

† The maxillary palpi also surpass the galea in *Spinoliella scitula* (Cresson) and *Hylæosoma atriceps* (Cresson), species formerly referred to *Calliopsis*. In the *Spinoliella* the first joint of the labial palpi is very stout and longer than the other three together; in the *Hylæosoma* it is scarcely as long as the other three together. In both the galea is broad and bristly at the apex.—T. D. A. C.

margin; third joint of maxillary palpi about ⅔ length of second .. *Dufourea vulgaris*, Schenck.

cc. Tongue broad and sharply pointed (dagger-like); galea broad, bristly at tip.

d. Labial palpi stout, first joint very stout; third joint of maxillary palpi hardly half length of second .... *Parahalictoides Tinsleyi*, (Ckll.).

dd. Labial palpi rather slender; third joint of maxillary palpi about ⅔ length of second .... *Parahalictoides paradoxus* (Moraw.).

AA. Maxillary palpi shorter than galea.

a. First joint of labial palpi much shorter than the other three together; maxillary palpi short and rather stout.... *Hesperapis rhodocerata* (Ckll.).

aa. First joint of labial palpi about as long as the other three together; maxillary palpi long, often almost as long as galea.

b. Galea short and broad, sepia-brown, its hind margin only bristly on apical portion .... *Panurginus Boylei* (Ckll.).

bb. Galea narrow and curved apically, the apical portion mostly hyaline, its hind margin bristly throughout.

c. Paraglossæ linear .... *Nomada xanthophila*, Ckll.

cc Paraglossæ broad .... *Panurgus Banksianus* (Kirby).

aaa. First joint of labial palpi decidedly longer than the other three together.

b. Maxillary palpi about or little over half length of galea.

c. Paraglossæ long and linear; second joint of labial palpi bristly and longer than the last two joints together .... *Nomada modesta* (Cresson).

cc. Paraglossæ shorter and shaped like a knife-blade; second joint of labial palpi short, no longer than third .... *Calliopsis verbenæ*, C. & P.

bb. Maxillary palpi not very much shorter than galea.

c. Galea with the apical portion much elongated, very narrow, and curved .... *Nomada fucata*, Panz.

cc. Galea broad, the apical portion not or scarcely elongated.

d. First joint of labial palpi not nearly twice as long as the other three together; tongue short (about as in *Dasypoda*).. *Hypomacrotera semirufa* (Ckll.).

dd. First joint of labial palpi at least twice as long as the other three together, tongue longer; paraglossæ quite slender.

e. First joint of labial palpi very long .... *Calliopsis coloradensis*, [Cresson.
ee. First joint of labial palpi somewhat shorter; tongue considerably surpassing labial palpi .... *Calliopsis chlorops*, Ckll.

The *Nomada* figured by E. Saunders (*l. c.*) has the labial palpi of the type of *N. xanthophila*, but the galea, as figured, is more like that of *Panurginus Boylei*. Saunders does not state the species. The species with the *N. xanthophila* type of palpi may be regarded as typical *Nomada*.

Nomada modesta, with the characters indicated in the table, may be taken as the type of a new subgenus, *Micronomada*.

Calliopsis verbenæ, with its long galea not abruptly narrowed at apex and the extremely long basal joint of labial palpus, may form the type of a new subgenus, *Verbenapis*.

We believe that *Phileremulus*, *Neolarra*, and probably *Allodape* are related to *Nomada*, and are therefore also derived from Panurgine ancestors.

EPEOLUS, Latr., 1802.

This genus is parasitic on *Colletes*, but cannot be derived therefrom. From all the genera discussed in connexion with *Nomada* it differs by its greatly reduced maxillary palpi, which have only two joints. Many species found in North America, formerly referred to *Epeolus*, have three-jointed maxillary palpi, and constitute the genus *Triepeolus* of Robertson (1901). Robertson thinks that *Triepeolus* is probably a parasite (or, rather, inquiline) of the Melissodinæ. Examining *Triepeolus verbesinæ* (Ckll.) as an example of the *Epeolus* type, we find that it has a broad blunt galea, with erect bristles at intervals on the outer margin, such as we find in several of the *Nomada*-Panurgine series. But the whole of the mouth-parts indicate the closest affinity with *Phileremus*. The characters which remove *Epeolus* and *Phileremus* from the *Nomada*-Panurgine series are the reduced maxillary palpi, and the broadened and flattened two basal joints of the labial palpi, with the two terminal joints diverging laterally, as in the ordinary long-tongued bees.

At this point we note that *Calliopsis chlorops* (a veritable Panurgine) has the first joint of the labial palpi broadened and flattened, while its paraglossæ are very like those of *Epeolus*. Furthermore, the series of *Phileremulus* &c., while departing very much in many respects from *Phileremus* or the Panurginæ, nevertheless forms in some ways a connecting-link between these groups. *Phileremulus* is remarkable for having a very long tongue, with entirely *Panurgus*-like labial palpi. *Allodape*, on the other hand, has the labial palpi wholly as in the ordinary long-tongued bees.

It would seem, then, that *Epeolus* and *Phileremus*, with their allies, have been derived from the Panurgine series, but from a higher type than *Nomada*. The resemblances we find between *Epeolus* and the Anthophorinæ may be explained by the probable fact that the Anthophorinæ themselves have a Panurgine ancestry, though they have now travelled far along their own special path.

Melecta, Latr., 1802.

Dalla Torre gives this as the first genus of the Nomadinæ. It is parasitic upon *Anthophora*, as also is *Crocisa*. In *Melecta miranda* we find the maxillary palpi very small, five-jointed, the last joint minute; the galea is very large, with a few short dark spines at the apex; the tongue and the labial palpi are of the type usual in long-tongued bees. In *Anthophora montana* we find the third joint of the labial palpi attached laterally some distance before the end of the second, at about the middle of the terminal narrowed portion of the second joint. The outer side of the two first joints is covered with bristles, which form a brush at the end of the second. In *Epeolus* and *Melecta* the last two joints are attached at the end of the second, as also in *Melissodes* and *Xenoglossa*. In *Epeolus*, however, the second joint is not narrowed apically, whereas in *Melecta miranda* it is greatly narrowed, with the narrowed portion largely hyaline. The galea of *Anthophora montana* has the same general form as that of *Melecta miranda*, but is distinguished by numerous strong bristles scattered over its surface. Much more similar to that of *Melecta*, when one goes into details, is the galea of the series of *Melissodes* &c. Thus in *Xenoglossa pruinosa* we find on the apical part of the galea a longitudinal series of bristles having tubular sockets, while the margin of the galea behind these bristles is abruptly narrowed and hyaline. The same row of bristles appears in the *Melecta*, but it is longer and the long hyaline area is not narrowed. In *Melissodes pallidicincta* the hyaline area is extremely small, but recognizable in comparison with the other genera.

From the above facts we must apparently conclude that *Melecta* is really derived from the Anthophorine series, but not from *Anthophora* itself.

ERICROCIS, Cresson, 1887.

We have examined *Ericrocis lata*, Cresson. Its evident affinity is with *Centris*, to which it is allied by the short paraglossæ and the vary peculiar form of the labial palpi and galea. The similarity of the galea even extends to the transverse brown spots, though the maxillary palpi in *Ericrocis* are reduced to two joints. Both *Centris* and *Ericrocis* are no doubt derived from *Exomalopsis* or a similar form.

THALESTRIA, Smith, 1851.

We have studied *Thalestria smaragdina*, Sm., collected by Mr. H. H. Smith at Chapada, Brazil. The maxillary palpi are reduced to two joints. The galea is large and broad, with the series of bristles having tubular sockets, as seen in *Xenoglossa*, while the ill-defined hyaline area is narrowed, though not strongly. The labial palpi are extremely hairy on the inner side, and the third joint is placed at the lateral apex of the second. All this indicates the origin of *Thalestria* from the Anthophorine series, near to the place of origin of *Melecta*.

Thus the "Nomadidæ" are of composite origin and should be divided into groups, somewhat as follows:—

Nomadinæ, for *Nomada* and its allies, to follow the Panurginæ.
[illegible]
Philereminæ, for *Phileremus* and [illegible]
Melectinæ, for *Melecta, Thalestria*, &c., to follow the groups of *Xenoglossa* &c.
Ericrocinæ, for *Ericrocis*, to follow the group of *Centris* &c.

The genus *Bombomelecta* falls in Melectinæ, and its affinity with *Xenoglossa* is further indicated by the very long paraglossæ, which, however, are devoid of hairs. The tip of the galea exhibits a number of flattened hairs, and exactly the same, but not so large, are found in *Melissodes*. The *Bombomelecta* studied is *B. thoracica*, var. *fulvida*, Cresson.

It is worth while to remark that the nest-building bees can be recognized by the comb of bristles on the basal part (stipes) of the maxilla. In the parasitic genera this is wholly wanting, the corresponding place presenting at most a series of fine short hairs.

All the slides used in this investigation were prepared by Mrs. W. P. Cockerell.

East Las Vegas, New Mexico, U.S.A.,
May 21, 1902.

VI.—*New and little-known Species of Eastern and Australian Moths.* By Colonel C. Swinhoe, M.A., F.L.S., &c.

Family **Eupterotidæ.**

Eupterote axesta.

Euterote axesta ♂, Swinh. Trans. Ent. Soc. 1894, p. 157, pl. ii. fig. 2.

♀. General coloration a uniform pinkish brown; thorax and abdomen slightly darker than the wings and more pinkish; the wing-markings much as in the male, the inner bands more indistinct, the discal straight bands dark brown-pink, with pale outer edging.

Size similar to the male.

A fine series of females lately received; though I have had many males from the Khasias, I never received a female before.

Family **Boarmiidæ.**

Corymica latimarginata.

♂ ♀. Bright yellow, irrorated with minute rufous atoms: fore wings with the costa pale rufous, black and white points on the costal edge, two brownish-grey marks on the costa before and at the middle, these being the commencement of incomplete outwardly curved obscure grey bands; the outer margin broadly rufous, its inner edge excavated below the middle and in some examples margined by a dark thick brown line: hind wings with a central obscure and irregular grey band and outer marginal narrower rufous band. The hind wing of the male has no tuft of hair on abdominal margin; the fore wings have the usual fovea of hyaline membrane, but rounder and smaller than usual in the genus; the outer margins of both wings are round and the apex of fore wings is not acute nor produced.

Expanse of wings $1\frac{1}{10}$ inch.

Lawas, Borneo (*Everett*).

There are examples of both sexes of this species from Pulo Laut in the B. M. unnamed.

Family **Limacodidæ.**

Nagoda francesca, nov.

♂. Branches of antennæ ochreous; shafts of antennæ, pectus, head, and body above brown-pink. Wings hyaline, the veins and borders brown-pink: fore wings with the discoidal vein and the stalk of veins 7, 8, and 9 thickened, the costa with a maroon band; the apical band rather broad, attenuated hindwards; the basal part and a broad band on the hind wings also brown-pink; in the centre of this band is a green spot: hind wings with a fairly uniform narrow band on costa and outer margin and broad band occupying a third of the wing-space on the abdominal margin. Underside: body and legs ochreous.

♀. Head, collar, and abdomen rufous; thorax green: wings of a uniform pale pink or pink-grey, thinly clothed, rufous at the base of fore wings; a large green round spot at middle of hinder margin; another similar spot on costa one fourth from apex; costa of fore wings and cilia of both wings rufous. Underside: body and legs rufous; wings coloured as above, but without any markings.

Expanse of wings, ♂ $\frac{9}{10}$, ♀ $1\frac{8}{10}$ inch.

Java.

All nine specimens are males; there are two males and one (the type) female in the B. M.

Parasa ostia, nov.

♂. Antennæ, palpi and frons, underside of thorax, and legs chestnut-colour; thorax and fore wings dark bright grass-green; a chestnut basal patch; costal line pale chestnut; cilia pale chestnut, with white patches; abdomen and hind wings paler green, the wings whitish towards the costa and outer margin and tinged with chestnut at the base and on the abdominal margin; cilia whitish, tinged with chestnut at the anal angle. On the underside the wings are of a pale uniform green, the base of both wings and costal line of fore wings chestnut; cilia of both wings pale chestnut, with white patches.

Expanse of wings $2\frac{1}{10}$ inches.

Khasia Hills; three examples.

Family **Drepanulidæ.**

Ectothyris quadrangulus, nov.

♀. Frons pure white; head and collar pale chocolate; a broad pale chocolate-brown band from costa of fore wings before the middle, outwardly curved and broadening hindwards and across the hind wings, also before the middle, this band containing several darker lines; there are broad chocolate-grey bands on all the borders of both wings, with two hyaline patches on each wing inside the bands, one on each wing between the base and the medial band and the other between the medial and outer bands; the thorax is grey, the abdomen pale chocolate-coloured; a duplex grey line limits the outer side of the outer hyaline patches, and there is a dark grey crenellated submarginal line on both wings. On the underside the wings are dark grey, with a broad still darker brownish-grey band before the outer margin across both wings and a brown marginal line.

Expanse of wings 1 inch

Goping, Perak (*Kunstler*).

Allied to *Ectothyris trifenestrata*, Swinh., from Palo Laut.

Family **Syntomidæ.**

Syntomis chroma.

Hydrusa chroma, Swinh. Cat. Het. Mus. Oxon. i. p. 50 (1892).
Syntomis annulata, Hmpsn. (part), Phal. i. p. 72 (1898).
Syntomis Clementsi, Hmpsn. Ann. & Mag. N. H. (7) viii. p. 167 (1901).

W. Australia.

The types (♂ ♀) are marked Australia in O. M.

The type *Clementsi* is from the Sherlock River, W. Australia, in B. M.

I have lately received over six hundred examples from Roebourne, 60 miles from the Sherlock River, which are identical with Hampson's type and with the types of *chroma*; they show very little variation. I never could understand why Sir George Hampson sank *chroma* as a synonym to *annulata*, Fabr., in 'Phalænæ,' vol. i. p. 72.

Family **Nycteolidæ.**

Ariolica chinensis, nov.

♀. Palpi orange-chestnut, with white bands and tip; frons orange-chestnut; head ochreous grey; body and wings pure white: fore wings with pale orange-chestnut bands, subbasal connected on the costa to the base, discal from centre of costa to the hinder angle, its inner side very sinuous, its outer side with two branches, one to the costa before apex and the other to the outer margin in the middle, where it joins a marginal band; there is also a thin costal band from the centre to the apex; all these bands are more or less margined with black on the sides: hind wings without markings. Underside white, with a blackish marginal band and a large orange-chestnut angular patch on the costa one third from apex, and black costal line broken in the middle.

Expanse of wings $\frac{9}{10}$ inch.

Omei-shan, W. China.

There are some examples in the B. M. mixed up with *A. pulchella*, Elwes, but it is nearer the Japanese form *A. argentea*, Butler; the bands are coloured with a distinct tinge of orange in them, not olive-green as in *pulchella*, and they are not one half the width.

Family **Trifidæ.**

Leucania Moorei, nov. nom.

Leucania abdominalis, Moore, P. Z. S. 1881, p. 348 (præocc.).

Moolten, Shan States (*Manders*); Dharmsala (*Hocking*); Port Blair, Andamans (*Wimberley*); Khandala, Bombay (*Swinhoe*); Bengal (*Hampson*); Khasia Hills (*Hamilton*).

Nonagria abdominalis, Walker, ix. p. 131 (1856), from Australia, is a true *Leucania*, therefore Moore's name must fall.

Family **Thyrididæ.**

Rhodoneura giulia, nov.

♂. Orange-red, wings striated with brown-red: fore wings with the costa streaked with white and black at intervals; a black mark at end of cell; a black boot-shaped subapical patch, with the toe touching the outer margin above the middle, and some black dots in the space below it; cilia silvery ochreous white, with some black marks: hind wings with a black medial band, slightly disjointed above the middle; a black streak on outer margin from the anal angle to the middle of the excavation; the rest of the margin with a few black marks; cilia as in fore wings, without any black marks. Underside brighter, with numerous, transverse, more or less dislocated, red bands across both wings; three large black patches on costa of fore wings and the boot-shaped subapical patch.

Expanse of wings $\frac{8}{10}$ inch.

Milne Bay (*Meek*); two examples, type, in B. M.

In the B. M. Coll. this form is put with *R. intimalis*, Moore, from Calcutta, as also is *brunnealis*, South, from China, *ulterior*, Warren, from Ceylon, *compunctalis*, Warren, from the Khasia Hills; but I do not believe that such very different-looking and different-sized moths can all belong to one species because they are more or less alike on their undersides; besides the types ♂ ♀ of *intimalis*, there are two specimens from Calcutta and one from Ceylon.

Family **Pyraustidæ.**

Hemiscopys suffusalis.

Scopula (?) *suffusalis*, Walker, xxxiv. p. 1471 (1865).
Botys Snellemanni, Snellen, Midl.-Sum. iv., Lep. p. 61 (1890).
Pyrausta violacea, Lucas, Proc. Linn. Soc. N. S. W. (2) vii. p. 263.

Type, Ceylon, in B. M.
Type (*Snellemanni*), Sumatra, in Coll. Snellen.
Type (*violacea*), Queensland, in Coll. Lucas.

I have some examples from Queensland that have been compared with Lucas's type; they are identical with Walker's type.

VII.—*Description of a new South-African Galeid Selachian.* By G. A. Boulenger, F.R.S.

[Plate IV.]

Scylliogaleus, gen. nov.

Characters of *Mustelus*, but nostrils as in *Scyllium*, covered with broad flaps which extend to the border of the mouth.

Scylliogaleus Queckelti. (Pl. IV.)

Distance between the end of the snout and the base of the pectoral fin one fifth of the total length. Snout much depressed, twice as broad as deep, with rounded horizontal outline, as long as the distance between the eye and the first gill-cleft, once and two thirds the diameter of the eye; spiracle small, oval, its diameter about equal to its distance from the eye; nasal flaps large, narrowly separated on the median line; both jaws with a well-developed labial fold, extending from near the symphysis of the lower jaw to the nasal flap and notched at the angle of the mouth; outline of the mouth evenly curved, not angular; teeth small and very numerous in both jaws, arranged like pavement, flat and ribbed with very feeble ridges; first gill-cleft as long as the eye, fifth two thirds that length; fourth and fifth gill-clefts above the base of the pectoral. Pectoral as long as its distance from the anterior border of the eye; ventral shorter, equally distant from spiraculum and from caudal fin; claspers small, simple. First dorsal midway between pectoral and ventral, its border strongly notched; second dorsal similar in form, but a little smaller, the posterior half of its base opposed to the small anal. Caudal fin two ninths of the total length, its lower lobe strongly notched. Dermal papillæ keeled and acutely pointed. Uniform grey above, white beneath; fins grey, caudal edged with white.

Total length 340 millim.

A single male specimen of this remarkable dog-fish was obtained off the coast of Natal in about 40 fathoms, and sent to me by Mr. F. J. Queckett, Curator of the Durban Museum, to whom I have much pleasure in dedicating the new species.

EXPLANATION OF PLATE IV.

Scylliogaleus Queckettii, $\frac{2}{3}$ nat. size, with lower view of head, nat. size, and enlarged view of mandibular teeth.

VIII.—*Further Remarks on the Carboniferous Ganoid,* Benedenius deneensis, *Traquair.* By G. A. Boulenger, F.R.S.

Not long ago I had the privilege in these 'Annals'[*] of adding to our knowledge of the rare fish *Benedenius deneensis*, of which specimens had been obtained from the original locality, a black-marble quarry at Denée, in Belgium, and deposited in the natural history collection of the Abbey of Maredsous. Quite recently yet another specimen has been brought to light in another quarry at Salet, near Denée, and having been acquired for the Maredsous collection, the Rev. Dom G. Fournier, O.S.B., has again been so kind as to place it in my hands for examination.

This new specimen appears to have been a little larger than the one previously figured in these 'Annals' (pl. ix.), measuring 240 millim. to the base of the anal fin, the caudal region not being preserved. Its bones and scales are in so disturbed a condition that few points call for special comment; but its chief interest lies in the fortunate fact that it affords the first definite information as to the shape of the teeth, and that, although the head cannot be described, the general proportions of the mouth leave no doubt as to the correctness of Dr. Traquair's allocation of Van Beneden's supposed *Palæoniscus* to the Platysomidæ. The length of the gape in this specimen appears to have been only about 25 millim. The teeth in both jaws may be said to be intermediate in shape between those of *Mesolepis* and those of *Eurysomus*†;

---

[*] Ser. 7, vol. iv. 1899, p. 445.

† *Cf.* Traquair, Tr. R. Soc. Edinb. xxix. 1879, pl. iv.

they are quite blunt, some with almost spherical crowns and with the base slightly but more or less distinctly constricted; they measure only about 1½ millim.

The longest branchiostegal rays, of which several lie scattered in various directions, measure about 25 millim. in length and 2 in width; they are therefore comparatively slender. The right ventral fin, pressed close to the origin of the anal, is well preserved and contains 14 rays, the longest of which measure 27 millim. The depth of the dorsal fin in front is 53 millim.

To sum up on the systematic affinities of *Benedenius*, from the evidence which we now possess, it may be said that that genus agrees most nearly in form and lepidosis with *Eurynotus*, in dentition with *Mesolepis*, whilst in the more slender branchiostegal rays it differs markedly from both, as well as from all Platysomidæ and Palæoniscidæ figured by Dr. Traquair or of which I have been able to examine specimens.

IX.—*Notes on the Phyllostomatous Genera* Mimon *and* Tonatia. By Oldfield Thomas.

Mr. Alphonse Robert has sent from Ypanema, São Paulo, a number of interesting leaf-nosed bats, and in working them out the following points have appeared and may be of service to students of the group.

Mimon Bennettii, Gray.

This excessively rare bat has hitherto only been known, so far as records are given, from the deteriorated type specimen, no. 7 *a* in the British Museum, received before 1838. That specimen was without locality, and it is therefore of importance to record that Mr. Robert has found the species at Ypanema, whence he has sent half a dozen skins which agree closely in all essential characters with the type. Like it they have only two lower premolars, a point about which Dobson expressed some doubt.

Tonatia.

Dr. Allen * has stated that this name, based on *Vampyrus bidens*, Spix, antedates and invalidates my *Vampyressa* of 1900. But the latter was founded, not on *Vampyrus bidens*, Spix, but on *Vampyrops bidens*, Dobson, a bat belonging to

* Pr. Biol. Soc. Wash. xiv. p. 184 (1901).

an entirely different group. The name *Tonatia* (Gray, 1827) was rightly applied by Mr. T. S. Palmer * in 1898 to the genus called *Lophostoma* (d'Orb., 1847) in Dobson's Catalogue, of which the type is Spix's species.

Tonatia amblyotis, Wagn.

Examples of this rare bat have been received by the Museum from Bogava, Chiriqui, Panama (*H. J. Watson*), and Bogota (*G. D. Child*). It may be noticed that by a mistranslation of a sentence in Peters's description ("durch ein kurzes Band mit der Stirn verbunden") the species is erroneously stated by Dobson to have a connecting-band across the forehead between the ears. The structure described by Peters is the usual small basal band behind each ear present in all members of the group. The point is of importance, as Dobson has placed the character in a prominent position in his synopsis of species.

X.—*Descriptions of new Species of Fossorial Hymenoptera from the Khasia Hills, Assam.* By P. Cameron.

This paper is in continuation of previous papers published in this Magazine on the Hymenoptera of the Khasia Hills. The types of the species are in the Collection of Mr. G. A. J. Rothney.

Ampulex Rothneyi, sp. n.

Black, with some violet patches on the head and thorax, the basal half of the hinder femora red; the wings smoky, the stigma and nervures black; the front wings with two cubital cellules. ♀.

Long. 16–17 mm.

Antennæ black, bare; the third joint nearly as long as the fourth and fifth united. Head well developed behind the eyes and not much narrowed there; the vertex is strongly punctured, more closely and strongly in front than behind; the front is coarsely and irregularly punctured; there is a longitudinal keel down the centre with some less distinct oblique keels running into it. Prothorax stout, twice longer than wide; the base is narrowed and is separated from the main body by a curved furrow. Mesonotum with two irregular transverse rows of furrows on the basal half. The

---

* Pr. Biol. Soc. Wash. xii. p. 111 (1898).

three central keels on the median segment are of equal length and reach to the apical area, which has two irregular longitudinal and two irregular transverse keels; the central part has the transverse striæ stout, those on the part bordering it closer and finer; on the two outer they are stouter and more widely separated; the lateral teeth are broad at the base. The upper half of the mesopleuræ is stoutly irregularly longitudinally striated; the lower strongly and closely punctured. The basal part of the metapleuræ irregularly shagreened; the lower irregularly obliquely striated. Legs black; the four anterior tibiæ and femora more or less blue in front; the tarsi are long and slender, with the joints not dilated. Abdomen black, very smooth and shining. The basal segment of the abdomen is narrowed into a narrow distinct petiole, which is clearly separated from the greatly dilated apical part, and it is nearly as long as it. The species is related to *C. Constanceæ*, Cam., but is much larger than it or *A. ruficornis*, Cam.

Ampulex trichiosoma, sp. n.

Blue, marked with greenish tints; the wings fuscous, with two transverse cubital nervures; the head obliquely narrowed behind the eyes; the pleuræ coarsely reticulated.

Long. 13 mm. ♀.

Antennæ black; the scape dark blue; the third and fourth joints equal in length. The vertex and the upper half of the front are dark blue; they are strongly irregularly striated, and irregularly punctured on the sides; the striæ behind and on the sides of the ocelli are curved, on the front they are twisted. The face and clypeus are minutely punctured; the centre of the clypeus is keeled and ends at the apex in a short blunt tooth. The part behind the eyes is straight and is obliquely narrowed, and ends in a distinctly separated neck, which is not much more than one half of the space behind the eyes. Mandibles black. The head is somewhat thickly covered with long black hair. Prothorax two-thirds of the length of the mesothorax, distinctly but not very closely punctured and covered with long black hair; the prosternum rugosely punctured. Mesonotum strongly, irregularly, and deeply punctured; the punctures run into reticulations behind; the mesopleuræ coarsely closely reticulated. Mesosternum coarsely transversely reticulated. Median segment transversely striated; the three central keels reach to the base of the apical third of the segment; the keel outside these reaches to the apex of the segment, which ends laterally in a stout, somewhat triangular tooth; the keel outside this again is shorter, reaching only to the base of the lateral tooth. Metapleuræ in the middle stoutly irregularly reticulated. Legs dark blue, thickly covered with long black hair; the tarsal joints are long and slender, and not much dilated at their apices. Abdomen shining, with a more distinctly blue tint than the thorax; the petiole is sparsely, minutely punctured; the second segment is, if anything, more closely punctured than it at the base, at its apex the punctures are stronger and more numerous; the apical segments are coarsely rugosely reticulated and punctured. Wings fuscous, with a distinct violaceous tint; the first transverse cubital nervure is obliterated entirely.

Ampulex ruficoxis, sp. n.

Bluish green, sparsely punctured; the four posterior femora, trochanters, and coxæ red; the wings fuscous violaceous, with three transverse cubital nervures; the front with three longitudinal keels. ♀.

Long 13 mm.

Antennæ black, slender, bare; the third joint fully one-third longer than the fourth. Head bare; the vertex is sparsely punctured; on the front a keel reaches from the ocelli to the face and one, two thirds of its length, runs to each antenna. Mandibles black, bare, rufous towards the apex. Prothorax bare, in length about one-third longer than the width at the apex; there is a distinct longitudinal furrow in the middle. Mesonotum almost impunctate; the mesopleuræ with longitudinal rows of deep punctures. The central keel on the median segment is longer than those on either side of it; the outer one unites to that bounding the apex; the striæ are moderately stout and close; the apical slope is shagreened and, on the upper part, is obscurely obliquely striated; the teeth are stout and bluntly rounded at the apex. The upper part of the metapleuræ is closely obliquely striated; the lower impunctate. Legs dark blue; the four hinder femora, except at the apex, the four hinder trochanters, the hinder coxæ, and the greater part of the middle pair vermilion-red. Wings fuscous violaceous, paler at the base; the three transverse cubital nervures are distinct; the first two are oblique, parallel, and straight. Abdomen smooth and shining; blue for the greater part; the narrowed basal half of the petiole is red, like the femora; the second segment is one-third longer than the width at the apex; all the segments are impunctate.

A distinct species. The characteristic features are the red coxæ and trochanters, the smooth head and thorax, the longish slender antennæ, and the three distinct longish keels on the front.

Cerceris fortinata, sp. n.

Nigra, facie clypeoque flavis, lineis duabus pronoti, tegulis, postscutello abdominisque segmento 3° late rufis, alis hyalinis, anticis fumatis. ♀.

Long. 12 mm.

Antennæ black, the scape brownish beneath, the former minutely punctured and covered with long white hair. Head black, the face, the inner orbits broadly on the inner side, the clypeus and oral region, except at the apex, lemon-yellow; front and vertex closely and strongly punctured and sparsely covered with longish white hair; the yellow-coloured part more sparsely punctured and (especially laterally) thickly covered with silvery pubescence, the apex of the clypeus slightly roundly projecting in the middle and depressed. Mandibles black, with a yellow mark at the base. Pronotum and mesothorax strongly and closely punctured; the propleuræ stoutly striated, the metapleuræ at the base above obliquely striated, below aciculated, the apex rugosely punctured. On either side of the pronotum, behind, is a broad band, the tegulæ and the postscutellum are rufous. The basal area on the median segment is triangular, is closely longitudinally striated, and has the basal half furrowed in the middle, the furrow being continued to the apex as an elongated area. Legs black, the knees and anterior tibiæ and tarsi in front rufo-testaceous, as are also the fore claws, the spurs are pale. Wings hyaline; the fore wings broadly smoky in front, especially towards the apex, on the radial and cubital cellules. Abdomen black, the third segment, except for a broad curved mark at base, rufous, the fifth segment is rufous at the apex. Pygidium irregularly wrinkled; the apex smoother and dull rufous, the hypopygium is deeply incised in the middle at the apex, the sides forming stout teeth.

Comes into Bingham's Section C $a\,c^{2}$, near *C. unifasciata*.

Cerceris erythropoda, sp. n.

Head and thorax rufous, largely marked with black; the area on median segment black; the petiole, the base of the second segment and the apex of the third rufous; the legs rufous; the wings for the greater part smoky fuscous; the stigma and the apex of the costa fulvous. ♀

Long. 17 mm.

Antennæ black; the basal two joints and the greater part of the third rufous. Head dark rufous; the front except below, the vertex except a large semicircular mark behind the ocelli, and the occiput broadly in the centre, black. Front and vertex closely punctured; the antennal keel stout, longish, and sharply pointed on the top. The cheeks are closely minutely rugosely punctured, the face and the centre of the clypeus are shining and distinctly but not closely punctured; the sides are punctured like the cheeks. Mandibles black, broadly rufous in the centre at the base. The upper part of the thorax is dark rufous, except the sides of the scutellum and post-scutellum, and the area on the median segment, which are black, the pro- and mesopleuræ are black, except above. The thorax is closely and minutely punctured, and is thickly covered with bright pale fuscous pubescence. Legs rufous; the apex of the hinder tibiæ all round, the apical half on the outer side, and the tarsi black. The wings have the radial and cubital cellules darker coloured than the others Abdomen black, the petiole, a band, rounded at the apex, on the base of the second segment and a narrow band on the apex of the third rufous. The third and following segments are closely and distinctly punctured; the basal two are less strongly, the pygidium opaque, irregularly reticulated, the fourth and fifth ventral segments are thickly covered with fuscous pubescence, the incision on the last segment is nearly as wide as it is long. The sides of the last segment are irregularly largely punctured. The petiole is short, broad at the sides, and nodose.

The apical margins of the abdominal segments are depressed and smooth The cheeks are covered densely with a golden pile, as are also the lower inner orbits. The area on the median segment is closely punctured and has a narrow smooth line down the middle. On the lower side of the mesopleuræ, near the apex, is a short, rounded, not very prominent, tubercle. The apex of the clypeus is roundly and deeply arched in front.

Comes near to *C dentata*, Cam., but, apart from the structural differences, it may be known from it by the great extension of the rufous colour and the absence of yellow markings.

Crabro assamensis, sp. n.

Niger, nitidus, linea pronoti, scutello, postscutello basi apiceque abdominis flavis; coxis posticis subtus dentatis; alis hyalinis. ♂.

Long. 8 mm.

Antennæ black, the scape lemon-yellow beneath; the base of the flagellum (the basal four joints) covered on the underside with long soft white hair. Front and vertex shining, smooth, plumbeous black; the frontal furrow indistinct; ocelli •.•; the face and clypeus thickly covered with silvery pubescence; the apex of the clypeus projecting in the middle and transverse. Mandibles yellow, black at the base and apex. Thorax smooth and shining, above with a plumbeous line; a broad line on the edge of the pronotum, slightly and roundly narrowed in the middle behind; the scutellum and postscutellum and the tubercles yellow. The "enclosed space" on the median segment is smooth and shining, and has a shallow furrow down the middle; the apical slope is aciculated irregularly on the upper edges; the middle furrow is deep; the middle and the sides on the apical part (almost the half) are distinctly keeled; pleuræ smooth and shining; the mesopleural furrow almost entirely and the lower half of the metapleural are crenulated. Sternum thickly covered with white hair. Legs black; the apex of the trochanters, the lower part of the four anterior femora, the outer side of the four anterior tibiæ, and a line on the outer side of the posterior, yellow; the middle tarsal joints are more or less rufous, as are also the calcaria; on the inner side of the hinder coxæ at the base is a broad tooth, narrowed and rounded at the apex; the intermediate tarsi have the middle joints spined. The petiole above has the sides and apex lemon-yellow; the black at the apex is dilated in the middle; below the apex is broadly yellow; the apex of the penultimate and the whole of the last segments are yellow; on the apex of the penultimate ventral segment are, in the middle, two broad projecting spines, which are narrowed towards the top; the base of the hypopygium is broadly raised at the base.

The female may have an irregular mark on the sides of the second and third abdominal segments, that on the third being the larger and more irregular; there may be a minute mark on the sides of the fourth; the large mark on the scutellum may be more or less incised at the apex; the pygidium is for the greater part yellow, and there may be yellow on the penultimate segment. The quantity of yellow on the tibiæ and on the femora in the male varies.

Crabro melanotarsis, sp. n.

Niger, scapo antennarum, linea pronoti, scutello, postscutello, femoribus, tibiis lineaque basi abdominis segmenti 3ⁱ flavis. ♀.
Long. 12 mm.

Scape of antennæ yellow; the flagellum covered with a pale down. Front and vertex alutaceous, sparsely covered with longish fuscous hair and with a golden down. Ocelli .˙. Face and clypeus thickly covered with golden-silvery pubescence, keeled in the middle; the apex of the clypeus transverse. Mandibles black. Thorax alutaceous, neither punctured nor striated; a broad band on the pronotum, the tubercles, the scutellum, and postscutellum yellow; there is a longitudinal furrow above the middle of the mesopleuræ. The "enclosed spot" on the median segment is alutaceous, there are a few striæ outside it; the middle furrow is narrow, but distinct. Legs black; the femora and tibiæ yellow. Wings smoky; the stigma fulvous; the nervures darker. Abdomen black, except for a yellow band near the base of the third segment; the pygidium is shining, its base bears large deep punctures; the middle is almost bare, the apex has a few small punctures; the penultimate segment bears a golden down.

Belongs to Bingham's Section B, in which it might form a new division *f.* "Mesonotum opaque, alutaceous," not distinctly punctured as in *c.*

Crabro fulvopilosellus, sp. n.

Niger, flagello antennarum subtus testaceo; abdomine flavo maculato, medio dense fulvo piloso; alis fusco-hyalinis. ♀.
Long. 14 mm.

Scape of antennæ lemon-yellow; the base of the flagellum rufo-testaceous, the rest of it testaceous, black above. The front is closely punctured; the vertex less closely and not quite so distinctly; the front is densely covered with golden pubescence; the vertex is sparsely covered with pale fuscous, behind with golden, pubescence; the outer orbits densely with silvery pubescence. Ocelli .˙.; below them is a shallow furrow. Clypeus keeled in the middle, densely covered with pale golden pubescence; its sides are waved; below the eyes the pile is of a brighter golden colour. On the pronotum is an interrupted yellow band; there is a yellow mark on its lower edge, a yellow mark on either side of the scutellum at the base, and the postscutellum is for the greater part yellow. The mesonotum is closely obliquely striated at the base; at the apex the striæ become longitudinal. The postscutellum is longitudinally striated. The "enclosed space" on the median segment has, on either side, three oblique keels, and there is also one on the outer side; the sides are irregularly obliquely striated, stoutly on the top, indistinctly and irregularly below. Propleuræ irregularly and indistinctly striated; the mesopleuræ strongly longitudinally striated, the perpendicular furrow with a few striations; the metapleuræ closely striated. Wings fuscous hyaline; the nervures black. Legs black; the four posterior trochanters are for the greater part yellow; the four posterior femora are broadly lined with yellow below; the middle have a yellow mark on the apex above; the four anterior tibiæ are more or less testaceous in front; the calcaria are dark testaceous; the base of the metatarsus is yellow. Abdomen black; the second and following segments marked laterally with irregular yellow marks, the mark on the second being the larger; on the penultimate is a broad transverse yellow band; the apex of the second narrowly, and the third and fourth are broadly, covered with dark fulvous pubescence; the pygidium is depressed at the apex, and has, on the sides, some large deep foveæ; the sides are sharply keeled; at the base of the depressed part there is, in the centre, a small yellow mark.

Belongs to the section with non-petiolated abdomen, and comes near to *C. auricomus*, Bingham (Faun. Br. Ind., Hymen. i. p. 322).

Crabo khasianus, sp. n.

Niger, basi mandibularum, scapo antennarum, linea pronoti, scutello, postscutello, pedibus lineisque abdominis flavis; pedibus flavis, coxis nigris; alis fumato-hyalinis, stigmate nervisque fulvis. ♀. Long. 15 mm.

Comes nearest to *C. auricomus*, Bing.: that species may be known from it by having the base of the median segment reticulated; the pronotum has only "indications" of a median groove, the tibiæ have only "very few spines," and the pronotum has no yellow line. Antennæ black, short; the scape straw-yellow, bare, shining. Head large, broad, largely developed behind the eyes; the face, clypeus, front, and hinder orbits covered with golden pubescence; the vertex has a bluish tinge, is shining, obscurely punctured, in front sparsely, behind thickly, covered with dark fulvous hair; the upper part of the front indistinctly, the lower more distinctly furrowed. Mandibles yellow, except at the apex, their base rugose; the eyes are oblique on the inner side above; the ocelli ·.· Thorax black; the apex of the pronotum, tegulæ, scutellum, its tubercles, the apex of the postscutellum, the pleural tubercles, and an oblique mark, more than double their length, yellow. The hair on the thorax is dense, short, dark fulvous above, paler on the sides; the furrow on the centre of the pronotum is deep and moderately wide; the base of the mesonotum is strongly and closely transversely striated, the striæ are curved at the sides. Scutellum strongly and closely punctured. Median segment opaque; its base obscurely longitudinally striated; the apex has an oblique slope, is furrowed narrowly down the centre, and, at the apex, is irregularly transversely striated. Propleuræ opaque, the lower part in the middle with some stout longitudinal keels; mesopleuræ shining, finely striated, more strongly and closely below than above; the metapleuræ finely and closely obliquely striated. Mesosternum closely punctured and thickly covered with fulvous hair. Legs yellow, their coxæ black; the apices of the tarsi and the hinder knees blackish; the hinder tibiæ stoutly and thickly spinose. Wings hyaline, with a distinct fulvous tint; the stigma and nervures are dark fulvous. Abdomen black, covered with a fulvous pile; the base of the petiole is triangular; there is a transverse yellow line near the apex of the petiole, a large transverse line, roundly incised at the apex, on the middle of the second segment, a narrower one in the centre of the third and fourth, both incised in the middle at the base, and a broader one on the sixth, yellow. The pygidial area is shining, its sides sharply margined, the basal two-thirds with large deep punctures, each having a long pale hair; the apex is closely finely rugosely punctured. The ventral surface is black; in the centre of the second segment are four small yellow marks, the two central being placed more behind than the others; the apices of the second and third segments are obscure rufous.

The colour of the hair in *C auricomus* is not stated; the striæ on the mesonotum are called "very fine and regular," the scutellum is said to be "slightly punctured" only, the wings "hyaline," in all of which points it differs from *C. khasianus*.

The male is similarly coloured; the middle joints of the antennæ are broadly dilated on the underside, and the flagellum is brownish on the underside. The apex of the median segment is, in some examples, distinctly transversely striated.

This is probably a variable species as regards coloration, size, and sculpture.

Psen nigrinervis, sp. n.

Niger, facie clypeoque denso argenteo pilosis; petiolo lævo; alis hyalinis, nervis stigmateque nigris. ♀.

Long. 11 mm.

Antennæ black; the scape sparsely covered with longish white hair; the flagellum almost bare. Head shining, the face, clypeus, and the outer orbits, except at the top, densely covered with long silvery hair; the front and vertex finely and closely punctured, more sparsely near the eyes; they are covered with long black hair; the front is not furrowed. Mandibles sparsely covered with white hair, and rufous before the teeth. Pro- and mesothorax sparsely covered with long fuscous hair; the metathorax, except at the base, more thickly with long white hair; the mesonotum closely and moderately strongly punctured; the scutellum impunctate; the basal area on the median segment strongly longitudinally irregularly striated, the central more widely separated than the lateral; the apex of the segment has an oblique slope; in the centre above there is a shallow area, rounded at the top; the apex with the sides bordered by oblique keels; the middle with a deep sharply bordered furrow, which becomes wider and deeper towards the apex; the sides have three stout oblique keels. Pro- and mesopleuræ smooth, the base of the latter with a crenulated furrow; the upper part of the mesopleuræ roundly raised and bordered below by a narrow furrow. The apex of the metapleuræ is reticulated and bordered on the inner side by a stout keel; the base is deeply depressed. Mesosternum smooth, shining, and covered with long fuscous hair; the broad middle furrow has a central keel. Legs covered with longish white hair; the calcaria, spines, and claws rufotestaceous. Wings hyaline, with a slight fuscous tinge; the first cubital cellule is half the length of the third, and receives the recurrent nervure in the basal fourth; the second recurrent nervure is interstitial. Abdomen, including the petiole, smooth and shining; the pygidial area closely aciculated, the sides with a few punctures margined by a distinct keel.

The transverse median nervure is not quite interstitial, it being received shortly behind the transverse basal; the apex of the clypeus projects outwardly and is slightly incised in the centre; the two longitudinal furrows on the basal half of the mesonotum are indistinct; there is a narrow keel on front extending from the front ocellus to the antennæ. The keels on the median segment are very irregular and more or less broken or disconnected; there is no central depression; the third joint of the antennæ is about one-third longer than the fourth. There is no clearly defined area on the base of the median segment. The species is allied to *P. orientalis* and *P. reticulatus*.

Tachytes andreniformis, sp. n.

Nigra, capite thoraceque dense aureo pilosis; pedibus rufis, coxis, trochanteribus basique femorum nigris; alis flavo-hyalinis, apice fere fumatis; cellula cubitali 2^a duplo longiore quam 1^a. ♀. Long. 17 mm.

Scape of antennæ brownish beneath, sparsely covered with long fuscous hair; the flagellum thickly covered with a pale down. Vertex covered with long fuscous hair, which does not hide the skin; the front, face, and clypeus thickly covered with longish bright golden hair, hiding completely the texture. Base of mandibles covered with pale golden pile, the middle is rufous; palpi bright rufo-testaceous. Thorax covered all over with bright fulvous hair; the texture under the hair is granular. On the mesosternum behind the transverse keel is a narrower longitudinal one; the metasternal area has a narrow keel, narrowed in the middle down the centre, the apex is depressed and rounded. Legs bright rufous, the coxæ, trochanters, and sometimes the base of femora, black; the tibial and tarsal spines are rufous. Wings distinctly yellowish hyaline; the nervures rufous, the apex slightly infuscated; at the top the first cubital cellule is equal in length to one-third the length of the second; the first transverse cubital nervure is obliquely curved above the lower fourth; the second recurrent nervure is received shortly beyond the middle of the cellule. Abdomen black, shining, the basal segment thickly covered with fuscous hair; the hypopygium is thickly covered with bright fiery-red pubescence; the epipygium is distinctly incised on the apex, the sides of the incision are somewhat oblique. The second recurrent nervure is roundly curved, not angled anywhere.

Agrees in form and coloration with *T. fulvopilosa*, which may be known from it by the first cubital cellule being not much shorter than the second, by the lower half of the first transverse cubital nervure being roundly curved, and by the lower part of the second recurrent nervure being angled.

Philanthus dentatus, sp. n.

Niger, clypeo, basi mandibularum maculisque duabus metanoti flavis; alis hyalinis, nervis stigmateque testaceis. ♀.
Long. 13–14 mm.

Antennæ black, the apex brownish beneath; the base of the flagellum distinctly narrowed, shining. Head black; the clypeus, a curved mark between the antennæ, the inner orbits broadly from the incision, the mandibles, except at the apex, the maxillæ, and a small mark in the middle behind the eyes, yellow. The clypeus is broadly and shallowly depressed in the middle; the apex is slightly depressed; black, marked with some indistinct striæ and roundly projecting; the sides above in the centre armed with stout black teeth. The vertex bears shallow punctures, which are more widely separated in the middle; the front is closely longitudinally punctured; the front ocellus anteriorly and the hinder ocelli laterally are bordered by a smooth shining depression; the outer orbits, except at the top, are impunctate. Thorax black, a small spot on the edge of the pronotum, the apex of the tubercles, a small mark behind them, and two small spots on the apex of the median segment, yellow. The pronotum above is transverse, raised and projects triangularly at the sides, and finely rugose. Mesonotum strongly and closely punctured. Scutellum shining, smooth, the sides and apex punctured. Postscutellum closely punctured. Median segment closely punctured; the base more closely than the apex; the base with a shallow indistinct furrow in the middle; the apex with a much wider deeper depression, which is smooth and shining, especially at the apex. Pleuræ closely punctured; the mesosternum less strongly punctured and more shining. Legs black; the apex of the femora, tibiæ, and the tarsi yellow in front, the posterior femora at the base yellow all round; the spines on the tibiæ and tarsi are numerous, stout, and sharp. On the apex of the petiole are two rufous marks with a small yellow mark on their outer side; the second segment is rufous, with a wedge-shaped mark in the middle, the narrow end being at the base, and at the apex, on the sides, is a yellow mark; the third, fourth, and fifth segments are lined with yellow at the apex; the last segment is shining, black, and bears a broad row of large punctures outside the middle.

The petiole is longer than the second segment, is narrow at the base, becoming gradually, but not much, wider towards the apex; the second segment has a narrow smooth depression at the base; the ventral segments are yellow on the sides. The eyes are distinctly emarginate on the inner side above.

A distinct species. In Bingham's arrangement (p. 294) it would come in near *depredator* and *basalis*.

Pseudagenia erythropoda, sp. n.

Nigra, dense aureo-pilosa; pedibus rufis, coxis trochanteribusque nigris; alis fusco-violaceis. ♀.

Long. 18–19 mm.

Hab. Sikkim, Khasia Hills, and Madras.

Antennæ entirely black, covered with a depressed pile. Head densely covered with golden pubescence; the hinder ocelli are separated from the eyes by a greater distance than they are from each other. Clypeus broadly rounded at the apex, bare, the rest covered with golden pubescence. Mandibles black or dark rufous, and covered thickly with depressed dark fulvous pubescence; the pubescence of variable tint. Thorax densely covered with depressed golden pubescence; the median segment strongly transversely striated, broadly furrowed down the centre, the furrow becoming wider towards the apex; the metapleuræ above obliquely striated. Legs rufous; the coxæ and trochanters black; the apices of the tarsal joints more or less black; the hinder spurs are black, at the base thickly covered with fulvous pubescence. Wings dark violaceous, the hinder pair lighter in colour; the transverse median nervure is received at some distance in front of the transverse basal; the first recurrent nervure is received at the base of the apical third, the second near the apex of the basal third of the cellule. Abdomen pruinose; the pygidial area is clearly defined, smooth, and shining, and is fringed laterally with long pale fulvous hair.

Comes nearest to *P. danaë*, which differs from it, *inter alia*, in having the scape of the antennæ and the trochanters ferruginous. The tarsi are rather thickly covered with short stiff spines; the amount of black on the hinder pair varies. Except that the basal cellule is paler, the fore wings are uniformly coloured. The species shows an approach to *Macromerus*.

Pseudagenia montanata, sp. n.

Nigra, femoribus posticis rufis; alis fere hyalinis, nervis nigris, cellula cubitali 2ª longiore quam 1ª. ♀.
Long. 13-14 mm.

Face and clypeus densely covered with silvery pubescence; the sides of the clypeus oblique; the apex depressed, smooth, and shining; the base of mandibles thickly covered with silvery pubescence. Palpi black, covered with silvery pubescence; the apex of mandibles piceous. Eyes scarcely converging above. Thorax thickly covered with silvery pubescence; scutellum and postscutellum aciculated. Median segment strongly, somewhat irregularly, but not very closely, transversely striated; the basal part broadly, but not deeply, furrowed down the middle. Pleuræ pruinose; the oblique furrow on the mesopleuræ narrow, but distinct; the part of the metapleuræ above the furrow is obliquely striated. Legs black, pruinose; the hinder femora, except at the extreme base and apex, red. Wings hyaline, with a slight fuscous tinge: the first cubital cellule is distinctly shorter than the second above and beneath; the first transverse cubital nervure is roundly curved; the transverse median nervure is widely remote from the transverse basal; the accessory nervure in the hind wing is shortly appendiculated. The wings have a slight, but distinct, fulvous-violaceous tinge. The tibiæ are slightly, the tarsi more thickly spinose. Tegulæ black. The abdomen is as long as the thorax; the base of the petiole is distinctly narrowed; the apical segments and, to a less extent, the basal are densely pruinose. The upper part of the propleura is broadly rounded; this dilated part is bordered at the apex below by a curved furrow, the part below this is roundly dilated, but not so much as the lower part. The apical part of the pronotum is transverse in the centre at the base. The claws are toothed at the base.

Comes nearest to *P. stulta*, Bingham.

Pseudagenia gnoma, sp. n.

Nigra, femoribus posticis rufis; alis hyalinis, macula substigmatali fusca. ♀.
Long. 10 mm.

Face and clypeus densely covered with a silvery pile. The apex of the clypeus depressed, smooth, and shining; the sides oblique to near the middle, which is rounded. Mandible black, broadly rufous before the apex; palpi black, covered with white pubescence. Eyes parallel, slightly converging at the top and bottom; the hinder ocelli separated from the eyes by double the distance they are from each other. Thorax pruinose; the median segment alutaceous, finely and closely transversely striated, obscurely at the base, more strongly at the apex; on the basal region in the middle is a broad shallow furrow. Legs pruinose, the tibiæ and tarsi spinose; the hinder femora ferruginous, except at the base and apex. Wings hyaline, iridescent, a fuscous cloud at the apex of the stigma, extending to the middle of the discoidal cellule on the inner side of the second recurrent nervure; the first cubital cellule is slightly shorter than the second; the first recurrent nervure is received shortly, but distinctly, in front of the middle, the second near the apex of the basal fourth of the cellule. Abdomen pruinose.

Comes nearest to *P. hypsipyle* in Bingham's Section D, p. 108, but is abundantly distinct.

Pseudagenia excellens, sp. n.

Ferruginea, dense aureo-pilosa; metanoto striato; alis fere hyalinis, nervis fuscis. ♀.

Long. 15 mm.

Antennæ of a paler ferruginous colour than the body, bare; the scape covered with short fulvous pubescence; the apical joints blackish. Front and vertex alutaceous, bare; the clypeus covered with depressed golden pubescence. Clypeus roundly convex, the apex smooth, bare, shining; the sides of the apex oblique. Mandibles of a slightly paler tint than the clypeus; the apex black; palpi with only the basal joints pilose. Eyes parallel; distinctly curved on the inner side. The propleuræ before the tegulæ raised, the raised part at the base bounded by a deep furrow; in the centre of the mesopleuræ is a narrow slightly oblique furrow, from its end a broader furrow runs to the bottom, this furrow being dilated at the top and bottom and irregularly striated. Mesosternum black; the sides at the apex roundly tuberculate. Legs of a brighter, slightly paler tint than the body; the apices of the joints of the hinder tarsi black. Wings hyaline, with a distinct fulvous smoky tint; the nervures dark fulvous; the second and third cubital cellules are equal in length on the top; the first recurrent nervure is received in the middle, the second near the apex of the basal third of the cellule; the basal two transverse cubital nervures are straight, oblique; the third is roundly curved.

Abdomen shining, the base of the petiole black; the apex of the pygidium is depressed, smooth, and shining, its sides keeled.

In Bingham's arrangement (Faun. Br. Ind., Hym. i. p. 107) this species would form a new section of A. "Wings yellow, apex infuscate." *c.* Head, thorax, and abdomen ferruginous, the head covered with a bright golden pile.

[To be continued.]

XI.—*Diagnoses of new Cichlid Fishes discovered by Mr. J. E. S. Moore in Lake Nyassa.* By G. A. Boulenger, F.R.S.

Paratilapia nototænia.

D. XVII 10. A. III 9. Sq. 36 $\frac{8}{12}$. Lat. l. 23/9.

Five series of teeth in both jaws, outer largest. Depth of body $2\frac{2}{3}$ times in total length, length of head 3. Snout with convex upper profile, a little longer than the eye, the diameter of which is 4 times in length of head; maxillary extending to below anterior border of eye; 3 series of large scales on the cheek; 11 gill-rakers on lower part of anterior arch. Dorsal spines increasing in length to the last, which measures a little more than $\frac{1}{3}$ length of head. Third anal spine $\frac{1}{3}$ length of head. Caudal slightly emarginate. Caudal peduncle $1\frac{1}{4}$ as long as deep. Scales with finely denticulated border. Brown above, white beneath; a blackish band along each side of the back, above the lateral line; dorsal fin with a regular series of round brown spots between every two rays; ventrals and anal blackish.

Total length 230 millim.

A single badly preserved specimen.

CYRTOCARA, gen. nov.

Allied to *Paratilapia*, but membrane between the dorsal and anal spines with rectilinear edge, not forming lappets, and four spines in the anal fin. Jaws with broad bands of conical slightly curved teeth, the outer enlarged and pointing outwards.

Whether or not the hump on the forehead, from which the generic name is derived, is a sexual character, as in some South-American Cichlidæ, is at present uncertain.

Cyrtocara Moorii.

D. XVI 11. A. IV 8. Sq. $37\frac{8}{11}$. L. lat. 25/16.

Depth of body 2½ times in total length, length of head 3½. Forehead with a strong dermal gibbosity; snout short, its profile descending very steeply; diameter of eye 3½ times in length of head; maxillary extending to below anterior border of eye; lower jaw projecting; four series of scales on the cheek; 10 gill-rakers on lower part of anterior arch. Dorsal spines rather feeble, increasing in length to the last, which measures ½ length of head; longest dorsal rays as long as head. Pectoral a little longer than head. Ventral as long as head. Caudal densely scaled, deeply notched. Scales with very indistinctly denticulate border. Brown above, whitish beneath; fins darker.

Total length 185 millim.

A single specimen.

Petrochromis Nyassæ.

D. XIX 8. A. III 7. Sq. $35\frac{4\text{-}5}{17}$. L. lat. 23/14.

Depth of body 2½ times in total length, length of head 3. Diameter of eye 4 times in length of head; mouth extending to between nostril and eye; teeth extremely numerous, forming very broad bands in both jaws; 4 series of scales on the cheek; 13 gill-rakers on lower part of anterior arch. Dorsal spines equal from the seventh, nearly half as long as head. Pectoral a little longer than head, nearly reaching origin of anal; ventral much produced, extending beyond origin of anal. Caudal slightly emarginate. Uniform olive-brown; a blackish opercular spot; dorsal and anal fins edged with blackish.

Total length 185 millim.

A single specimen.

Closely allied to *P. polyodon*, Blgr., from Lake Tanganyika, but one spine more in the dorsal, pectoral and ventral more elongate, and scales more numerous in a vertical series.

HEMITILAPIA, gen. nov.

Like *Tilapia*, Smith, but jaws with moderately broad bands of slender club-shaped movable teeth, with slightly incurved crowns, those of the outer series larger, with the crown obliquely truncate and pointing forwards.

Hemitilapia oxyrhynchus.

D. XVI 10–11. A. III 9. Sq. 36 $\frac{3-4}{11}$. Lat. l. 22/15.

Depth of body 2½ times in total length, length of head 3. Snout pointed, with concave profile, 1½ to twice as long as the eye, the diameter of which is 4 to nearly 5 times in length of head; maxillary extending to between nostril and eye; 4 series of scales on the cheek; 12 gill-rakers on lower part of anterior arch. Last dorsal spine longest, ⅖ length of head; longest dorsal rays nearly as long as head. Scales with very finely denticulate border.

Total length 180 millim.

Two specimens, in poor condition.

BIBLIOGRAPHICAL NOTICES.

Palæontologia Indica. Series XVI. Vol. I. Part 3. *Fauna of the Upper Cretaceous (Maëstrichtian) Beds of the Mari Hills.* By FRITZ NOETLING, Ph.D., Palæontologist, Geol. Surv. India. Folio. 79 pages; plates i.–xxiii. Calcutta: Geol. Survey Office. London: Kegan Paul & Co. 1897.

It is believed that this account of the species here described and figured has a special interest in throwing some light on the geographical distribution of the Upper Cretaceous fauna. The fossils of this formation collected in Baluchistán (77 in number) afford 66 determinable species, of which 42 are new, and 24 are identified with forms previously described. Of these last, there are seven which hitherto are only known to occur in Indian or Central-Asian beds, viz.:—

1. Cardita Beaumonti, *d'Arch. & Haime* (Sind), var. baluchistanensis, *Noetl.*
2. Cardita subcomplanata, *d'Arch. & Haime.* Sind.
3. Radiolites subdilatata, *Muschketoff.* In strata of Senonian age in Turkestan.
4. Corbula harpa, *d'Arch. & Haime.* Sind.
5. Ovula expansa, *d'Arch. & Haime.* Sind.
6. Volutilithes latisepta, *Stoliczka.* In the Ariyalur strata of Southern India.
7. Nautilus subfleuriausianus, *d'Arch. & Haime.* Sind.

There remain, therefore, 17 species, or 26 per cent. of the total number, which the Baluchistán Upper Cretaceous Beds have in common with the Cretaceous Beds of Europe; and it is these we have chiefly to consider in looking for information as to the age and correlation of the *Hemipneustes* beds (as they may be conveniently styled). The following table indicates to some extent the geological distribution of these 17 species :—

1.	Orbitolites macropora, *Defr.*	*
2.	Orbitoides socialis, *Leym.*	*
3.	Cyclolites regularis, *Leym.*	*
4.	Pyrina ataxensis, *Cotteau*	*
5.	Hemipneustes pyrenaicus, *Hébert*	*
6.	Hemipneustes Leymeriei, *Hébert*	*
7.	Ostrea acutirostris, *Nilsson*	*†
8.	Ostrea pectinata, *Lamarck*	*†
9.	Ostrea ungulata, *Schloth.*	*
10.	Gryphæa vesicularis, *Lamarck*	*
11.	Exogyra pyrenaica, *Leym.*	*
12.	Spondylus santoniensis, *d'Orb.*	*†?
13.	Vola quadricostata, *Sow.*	*
14.	Pecten Dujardini, *Roemer*	*†
15.	Trochus Lartetianus, *Leym*	*
16.	Nerita pontica, *d'Arch.*	*†?
17.	Nautilus sublævigatus, *d'Orb.* (N. Labechi, *d'Arch. & Haime*)	*†?

The species marked * belong to the Aturian or Upper Senonian Series; and those marked † to the Emscherian or Lower Senonian Series also.

It is suggested by the author, with some reserve, that there is good evidence of the *Cardita Beaumonti* beds belonging to a higher position in the Cretaceous series than *Hemipneustes* beds; and he thinks that the above list unquestionably shows that the *Hemipneustes* beds of Baluchistán are of Senonian age, representing the upper part (or étage Aturien) of that formation, and most probably homotaxial with the étage Maëstrichtien of the French authors.

As to the relationship of the *Hemipneustes* beds to those of similar age in other parts of the world, Dr. Noetling finds it difficult to define. In Southern India only six species seem to be common to Baluchistán and Ariyalur in Southern India, namely Nos. 7, 8, 9, 10, and 13, together with *Volutilithes latisepta*, Stoliczka.

"The Upper Cretaceous beds of Asia Minor share only a few species with the *Hemipneustes* beds. The fauna of the Upper Cretaceous beds of the south-western corner of France bears a strong resemblance to that of the *Hemipneustes* beds of Baluchistán. Except such ubiquitous forms as *Vola quadricostata*, &c., the following species are common both to the Maëstrichtian of south-western France and the *Hemipneustes* beds of Baluchistán :—

Orbitolites macropora, *Defr.*
Orbitoides socialis, *Leym.*
Cyclolites regularis, *Leym.*
Pyrina ataxensis, *Cott.*
Hemipneustes pyrenaicus, *Héb.*
Hemipneustes Leymeriei, *Héb.*
Exogyra pyrenaica, *Leym.*
Trochus Lartetianus, *Leym.*
Nerita pontica, d'Arch.

"And probably also

Nautilus sublævigatus, *d'Arch.*

"It is certainly highly remarkable that, even if we exclude the first and last two species, as occurring elsewhere in similar strata, there are certainly six species which have hitherto only been observed in the Upper Cretaceous beds of Southern France and the *Hemipneustes* beds of Baluchistán. This seems to point to similar physical conditions under which the Upper Cretaceous beds were deposited in South-western France and Baluchistán. Another most remarkable fact is that the *Hemipneustes* beds do not share a single specimen with the Upper Cretaceous beds of Palestine and North Africa. It may be doubtful whether strata of the age of the *Hemipneustes* beds are developed in Palestine; but they certainly occur in North Africa.

"These considerations lead us to the conclusion that the *Hemipneustes* beds are of Upper Senonian age, and most probably represent the étage Maëstrichtien. The fauna therein contained bears hardly any resemblance to the fauna of similar age in Southern India or Northern Africa. On the other hand, it exhibits the closest relationship to the fauna contained in beds of similar age of South-western France. The fauna of the *Hemipneustes* beds must therefore be considered as belonging to the European province of the later Cretaceous sea, and living probably in close proximity to its eastern shores. This sea was most probably divided by a comparatively narrow land-barrier from the sea in which the Upper Cretaceous fauna of Southern India lived—a view first expressed by Dr. Blanford, and not, as I erroneously stated, by the late Professor Neumayr."

The 23 quarto plates supply good illustrations of seventy-nine Upper Cretaceous Baluchistán species, fully described as 3 Rhizopods, 3 Corals, 16 Echinoderms, 26 Pelecypods, 24 Gasteropods, 6 Cephalopods, and 1 Crustacean. The several generic facies remind us of some of the Lower Cretaceous, as well as of many of the Upper Cretaceous, forms of Western Europe.

The author is conscientiously careful in terminology and nomenclature, and is very correct in orthography; yet the modern confusion in the names of the Ammonoidea has entangled him, as usual with less educated writers, and allowed him to let slip a false concord in the specific name of *Indoceras* at several pages.

Notes on the Morphology of the Pelecypoda. By Fritz Noetling, Ph.D., F.G.S. *Palæontologia Indica.* New Series. Vol. I. Part 2. 57 pages, 4 plates (ii. to v.), and 8 cuts. Folio. 1899. Calcutta: Geol. Survey Office. London: Kegan Paul & Co.

After dwelling on the insufficiency of the common method of describing the hinge-teeth of the Bivalved Molluscs (*Bivalvia*, Linné, *Acephala*, Cuvier, *Lamellibranchia*, Blainville, *Pelecypoda*, Goldfuss), which are here treated under the group-name given by Goldfuss, the author proceeds to illustrate and explain the well-based and philosophical system of terminology for these teeth as elaborated by Munier-Chalmas, Stefanescu, and Bernard, and founded on the development of the hinge. Although the homologies are as yet other merely a sinus. As the outer lip is rarely well preserved, it is difficult and sometimes impossible to decide whether a particular individual belongs to one or other of those two types. With regard to these shells, two important questions require to be answered. Firstly, whether the slit or the sinus characterizes the more primitive type; and, secondly, whether the elongated *Murchisonia* and the shorter *Pleurotomaria* are both derived from the same stock, and which of them appears the earlier. Before considering the British evidence, the work of foreign palæontologists is reviewed by the authoress. From the material at present available, in the British Isles as well as in America and the Baltic Provinces, elongated forms with a sinus precede those with a slit. There are at least two distinct groups of sinuated shells with a band: one, containing *Hormotoma*, *Ectomaria*, etc., having the lines of growth sweeping back to and forward from the band very obliquely; and a second, containing *Lophospira*, having the lines less oblique and agreeing more in direction with those of *Murchisonia*, only the band is prominent instead of being grooved. A possible third group is indicated by a subgenus, subsequently described, in which the lines of growth are but slightly oblique and the band grooved. The first two groups in Britain range from Upper Cambrian to Silurian rocks, and the third from the Bala to the Silurian. The genus *Murchisonia* may have begun in the Wenlock Formation. So far, no light is thrown on the question as to whether *Murchisonia* and *Pleurotomaria* were derived from the same stock, nor has the authoress yet met with any specimens showing a transition from sinus to slit.

In the latter part of the paper three new subgenera, eleven new species, and one new variety are described and figured.

April 30th, 1902.—Prof. Charles Lapworth, LL.D., F.R.S., President, in the Chair.

The following communication was read:—

'Revision of the Phyllocarida from the Chemung and Waverly Groups of Pennsylvania.' By Prof. Charles Emerson Beecher, Ph.D., F.C.G.S.

The specimens described in the paper, as well as those on which the original descriptions were based, were all obtained in the vicinity of Warren, Philadelphia. The chief horizon is in the shale-beds of the Upper Chemung Group, about 50 feet above mean water-level in the Allegheny River. The deposits are called by the writer the 'Phyllocarid-Beds.' Additions and emendations to the original diagnoses of the following genera and species are given:—*Echinocaris socialis*, Beecher; *Tropidocaris*, *Tr. bicarinata*, Beecher, *Tr. alternata*, Beecher; *Elymocaris*, *E. siliqua*, Beecher; and two new species of *Echinocaris* are described.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 56. AUGUST 1902.

XII.—*Descriptions of new Species of Fossorial Hymenoptera from the Khasia Hills, Assam.* By P. CAMERON.

[Concluded from p. 69.]

Salius intimellus, sp. n.

Niger, antennis, clypeo, labro, orbitis oculorum, antennis, tibiis tarsisque ferrugineis; alis flavo-hyalinis, basi nigra. ♂.
Long. 22 mm.

The apical joints of the antennæ are infuscated. The inner orbits and the outer above are narrowly lined with rufous; the parts between and below the antennæ including the labium are rufo-testaceous; the mandibles are black, rufous above to shortly beyond the middle; palpi black. Thorax velvety black, thickly covered with black hairs; the median segment transversely striated. Legs black; the tibiæ, except at the extreme apex, and the hinder tarsi rufo-testaceous; the four anterior tarsi blackish testaceous; the tarsi have one stout tooth near the base. Wings yellowish hyaline, deep blackish violaceous behind the transverse basal nervure and on the lower side to shortly beyond the submedian nervure. Abdomen velvety black.

Belongs to the section with one tooth on the claws, in which it forms almost a group by itself. It has a considerable resemblance to *S. bellicosus*, but that belongs to a different group.

Salius khasianus, sp. n.

Black; the antennæ, the head, except round the ocelli, the apical half of the pronotum, and the legs ferruginous; the coxæ, trochanters, and the base of the femora narrowly black; the apical three segments of the abdomen rufous, the last thickly covered with rufous hair; the wings uniformly dark fuscous-violaceous, the nervures and stigma black. ♀.

Long. 23 mm.

Antennæ ferruginous, the scape covered with a pale pile, bare. The greater part of the occiput and the ocellar region are black; the vertex is sparsely covered with long black hair; the front has a shallow but distinct furrow in the centre. Apical region of the clypeus sparsely covered with long black hair; the apex of the labrum is incised. The mandibles are of a paler colour than the head; their apex deep black. Thorax black, except the apical half of the pronotum, which is rufous; the mesonotum has a brownish pile; the scutellums are flat; the median segment is irregularly transversely striated. The coxæ and trochanters are thickly covered with a dull golden pile on the lower side; the claws have one basal tooth. Abdomen black; the apical three or four segments rufous; the last thickly covered with rufous pubescence.

Looks at first sight like one of the varieties of *S. bipartitus*, but, apart from the differences in coloration, it may be known from it by the minute—not large stout—tooth on the claws. It wants the golden pile found on the head and thorax of *S. consanguineus*, which has also the prothorax entirely, and the mesonotum and the scutellum also, reddish yellow, and the front immaculate; its ocelli are more widely separated, especially the posterior, which are separated from each other by a distinctly greater distance than they are from the anterior, which is not the case with the present species.

Salius assamensis, sp. n.

Long. 17 mm. ♀.

This species looks like a small example of *S. DeNicevillii*, but, apart from its smaller size (*DeNicevillii* is from 20-30 mm. in length), its body is much less pilose, it having hardly any hair; the postscutellum is more prominent, and has the sides and apex more obliquely sloped; the median segment has a more oblique straight slope from the base to the apex, the latter not being depressed, and the third transverse cubital nervure is broadly rounded, while with the larger species its upper half has a straight oblique slope. Antennæ fulvous, paler towards the apex. Head bright rufo-fulvous, covered thickly with a golden pile; the vertex bears a few longish black hairs. Clypeus broadly rounded at the apex; the apical half bears some long dark fulvous hairs. Mandibles coloured like the head; the apex broadly black. Ocelli in a triangle; the hinder separated from each other by a slightly less distance than they are from the eyes. Thorax thickly covered with a golden pile; bare except for a few longish hairs on the scutellums; the base of the mesonotum and of the median segment black. The median segment short, with a somewhat steep rounded slope; it is irregularly, somewhat widely, transversely striated, and is furrowed down the middle, the furrow becoming wider towards the apex. The base of the meso- and metapleuræ more or less blackish, as is also the sternum. Wings yellowish hyaline, with a distinct fuscous-violaceous tinge; the nervures fulvous; the first and third transverse cubital nervures are roundly curved, the second is oblique and roundly curved outwardly on the lower half. Legs coloured like the body; the four hinder coxæ broadly black at the base behind, the single tooth on the claws is short and stout. Abdomen of a darker red than the thorax, shining, bare, except on the apical segment, which is covered with long fuscous hair and with a bright golden pile.

Salius junctellus, sp. n.

Niger, dense aureo-sericeus; antennis nigris, basi late rufa; alis flavo-hyalinis, apice fumato. ♂ et ♀.

Long. 22 mm.

The five basal joints of the antennæ rufous, the others black. Head above the clypeus black, densely covered with golden pubescence and more sparsely with longish pale hair; the clypeus apparently fulvous and densely covered with depressed fulvous pubescence; its apex slightly waved, trilobate. Mandibles ferruginous, densely covered with depressed fulvous pubescence; the apex black. Thorax black, densely covered with depressed golden pubescence. Legs ferruginous, the coxæ and trochanters black; the apices of the basal tarsal joints and the apical two entirely black; the claws with one tooth at the base. Wings yellowish hyaline, the nervures fulvous, the apex smoky from the end of the radial cellule; the first and second cubital cellules are equal in length above; the first recurrent nervure is received shortly beyond the middle, the second at the apex of the basal third.

Abdomen densely golden sericeous above, below not so densely; the apical segments densely covered with stiff fulvous hairs. The ground-colour of the body is black; it is the dense pile which gives it the golden appearance. In addition to the hairs the pygidium is thickly covered with bright, stiff, golden pubescence; the second transverse cubital nervure is broadly and roundly curved outwardly, not straight and oblique as with the allied species.

Allied to *S. sericosoma*, Sm., from which it differs in having the antennæ longer and more slenderly built, in having the apex of the wings distinctly fuscous, in the second transverse cubital nervure roundly curved outwardly, in the second or third apical segment of the abdomen not being ferruginous, and the coxæ and trochanters are black.

Salius curvinervis, sp. n.

Rufo-ferrugineus; abdomine nigro lineato; alis brunneo-fumatis, nervo basali curvato; pedibus ferrugineis; coxis subtus nigris. ♀.

Long. 18–19 mm.

Antennæ short, stout, bare, ferruginous, as is also the head. Eyes parallel, hardly converging above; the ocelli separated from them by the same distance they are from each other; the front is thickly covered with short reddish-green pubescence and is furrowed down the middle. Apex of clypeus transverse, the sides oblique; mandibles ferruginous, black at the apex. Pro- and mesonotum dark ferruginous, thickly covered with golden pile, which shines in certain lights. Median segment irregularly, not very closely, striated, its apex with an oblique slope; the lower side and apices of the meso- and metapleuræ and their bases more broadly black. Legs coloured like the body; their coxæ are black behind; the claws have a large apical and a smaller basal tooth. Wings dark fulvo-hyaline, with a slight violaceous tint; the nervures pale yellowish; the first cubital cellule is shorter than the second at top and bottom; the first transverse cubital nervure is oblique, the second is straight, the third roundly curved; the first recurrent nervure is interstitial, the second is received near the apex of the basal third of the cellule; the accessory nervure in the hind wing is interstitial. Abdomen with the base of the petiole broadly, its apex narrowly, the base and apex of the second and third, and the base of the last distinctly, and the middle segments indistinctly, banded with black; the pygidium is thickly covered on the middle and apex with long bright fulvous hair, the apex is smooth and shining, its sides distinctly keeled; the ventral segments are more broadly banded with black.

A species easily known by the roundly-curved transverse basal nervure. The male is similarly coloured to the female. The colour of the wings varies: in some examples it is deep fuscous violaceous, the brownish tint being absent. The species comes close to *S. fenestratus*, Sm.

Salius brevipennis, sp. n.

Niger, dense aureo-hirtus, basi antennarum late ferruginea; pedibus abdominisque apice rufo-flavis; alis fusco-violaceis, nervis stigmateque nigris. ♀.

Long. 18 mm.

Belongs to the section with bifid claws and with "wings fuscous brown or black, with generally a brilliant purple-blue or green effulgence," and to the group with "hyaline spots in the fore wings." It comes nearest to *S. placidus*, Bingh., which differs from it in having the hyaline cloud in the first discoidal and the second submedial cellules, and differs further in the pile on the head and thorax being "silvery grey" not golden; the head largely marked with yellow;

abdomen only black at the base, not
ex.
f the antennæ ferruginous, the rest
kly covered with golden pubescence;
black at the base; the apex trans-
; the apex of the labrum rounded,
hairs; the mandibles rufous; the
palpi testaceous yellow; the eyes
ds the bottom; the ocelli are sepa-
rated from the ey . greater distance than they are from each other. Prothorax large, the base transverse, the sides rounded, above thickly covered with depressed golden pubescence, as is also the mesonotum. The scutellum and post-scutellum not much raised. The median segment has on the apex an oblique slope and is stoutly transversely striated. Pro- and mesopleuræ covered with golden pubescence and with shallow punctures; the upper part of the metapleuræ at the base smooth and limited by an oblique keel; the base below this smooth, opaque, and marked with a few scattered punctures, over the coxæ strongly punctured; the apical division strongly obliquely striated, punctured near the spiracles. Mesosternum thickly covered with golden pubescence and furrowed down the middle. Wings uniformly fuscous violaceous; on the base of the discoidal cellule is a

hyaline spot, followed by a dark one; the radial nervure is curved; the first cubital cellule at the top is, if anything, longer than the third; the first recurrent nervure is received shortly beyond, the second in the middle of the cellule. Legs entirely rufo-fulvous, covered (especially on the tibiæ) with a golden down; the claws bifid, the basal claw shorter and thicker; the tibial spines rufous. Abdomen black, covered with golden depressed pubescence; the basal segment not much narrowed at the base, the apex of the third and fourth segments and the apical ones ferruginous.

The wings are shorter than usual, not extending beyond the middle of the abdomen.

* *Pompilus laticollis*, sp. n.

Niger, abdomine purpureo, prothorace rufo; alis violaceis, basi hyalinis. ♀.
Long. 18 mm.

Antennæ as long as the thorax, distinctly tapering towards the apex, bare. Head shining, impunctate, pruinose; the sides of the clypeus broadly rounded, the centre transverse. The inner orbits from the top of the eye-incision are bordere
with pallid yellow; the top of the
the eyes lined with red. Ocelli •.•;
the eyes by a less distance than th
Prothorax red; meso- and metathorax
the apex of the metathorax is rou
triangular; it has a slightly obliqu
down the middle. Wings violac
the transverse basal nervure hyalin
slightly more than the basal half
second cubital cellule is twice the
ne third, below they are equal; the first transverse cubital nervure is sharply obliquely angled above the middle, the second is only very slightly oblique, the third is roundly curved; the first recurrent nervure is received at the base of the apical third, the second near the middle. Legs pruinose; the claws bifid, the basal claw thick. Abdomen bluish purple, pruinose; the pygidium has a deep depression, longer than broad, at the apex.

Belongs to the *Ferreola* group. The head is concave in front, transverse behind; the sides of the elongated prothorax project behind to the middle of the tegulæ; there is a narrow oblique furrow on the middle of the mesopleuræ. It comes nearest to *P. circe*, Cam., but is a larger species; the prothorax is not longer than the mesothorax, being broader than long, not longer than broad as in *circe*, while in the latter it is slightly but distinctly narrowed in the middle.

The male is smaller, the yellowish border behind the eyes narrower and less distinct, and the third cubital cellule is much more narrowed on the top, being there almost only the half of the length of the space bounded by the second recurrent and the third transverse cubital nervures.

Pompilus Hookeri, sp. n.

Niger, abdomine fero purpureo; alis violaceis, basi late hyalinis. ♂. Long. 15 mm.

Head transverse behind and little developed behind the eyes, shining, the front and vertex sparsely covered with white pubescence; the hinder ocelli are placed in deep pits and are separated from each other by about double the length they are from the eyes; the front and clypeus are thickly covered with silvery pubescence, the apex of the clypeus is almost transverse, the sides obliquely rounded. Mandibles dark rufous before the apex. Palpi black, thickly covered with white pubescence. Thorax densely pruinose, the pubescence giving it a pale appearance; on the sides of the mesonotum are two not very distinct longitudinal furrows. Scutellum large, dilated at the sides on the base; the sides at the apex rounded. The apex of the median segment is roundly incised, the dilated parts seen from the side are rounded. The furrow in the middle of the mesopleuræ is deep, distinct, and moderately wide; the apex is distinctly crenulated; the depressions between the keels are deep and longest in the middle of the pleuræ. The lower part of the metapleuræ is slightly depressed and bears some stout irregular striæ. Legs pruinose, the spines black. Abdomen velvety and with a distinct purple tint, the sides, apex, and ventral surface covered with black hairs; the apical ventral surface is incised in the middle. The wings are blackish violaceous from shortly behind the transverse basal nervure, the rest clear hyaline; the first cubital cellule is one-third longer than the second above; the first recurrent nervure is received near the base of the basal third, the second shortly beyond the middle of the cellule; the transverse basal nervure is interstitial. The claws are rufous and bifid.

This species comes near to *P. ilus*, Bing., but is, I believe, judging from the descriptions, distinct. In *ilus* the wings are hyaline for half their length; the clypeus is "widely emarginate anteriorly," while in the present species it is transverse; the sides of the metathorax are said to be produced into "sharp tubercles," here broadly rounded; the emargination is said to be "longitudinally striated," here there are only three stout irregular keels. If the figure of *ilus* (Journ. Bomb. Nat. Hist. Soc. 1893, pl. i. fig. 7) is correct, then *ilus* differs from our species in having the first cubital cellule on the top distinctly shorter than the second, whereas in our species it is the second which is distinctly shorter than the first. In *Hookeri* the third transverse cubital nervure is not broadly rounded, but has an oblique straight slope above.

Pompilus subfervens, sp. n.

Niger, antennis, capite, linea pronoti, macula mesonoti, scutello pedibusque ferrugineis; apice antennarum, coxis, trochanteribus basique femorum nigris; alis violaceis ♀.

Long. 14 mm.

Antennæ with the apical three joints black; the scape covered with short golden pubescence. Head shining, the cheeks and the clypeus sparsely covered with a short golden pile; above there is a broad black band extending from behind the ocelli to near the base of the antennæ, where it is divided in the middle by a tubercle which has an elongated fovea in the middle above; there is a narrow furrow below the eyes, which distinctly converge above; the hinder ocelli are separated from the eyes by the same distance they are from each other. Apex of clypeus rounded; mandibles black, ferruginous at the apex; palpi fulvo-testaceous. Pronotum broadly ferruginous behind, its sides there with an oblique slope to the middle; in the centre of the mesonotum behind is a large mark, slightly narrowed towards the apex, its sides projecting at the base. Scutellum flat, ferruginous above, except narrowly at the apex. Median segment with a gradually rounded slope, thickly covered with peach-coloured pubescence and sparsely with black hairs; the apex is indistinctly transversely striated. Legs ferruginous; the coxæ, trochanters, and base of femora black; the apices of the joints of the posterior tarsi and the apical joint of the middle and posterior entirely black; the tooth on the middle of the claw is distinct. Wings uniformly deep violaceous; the first cubital cellule is shortly but distinctly longer than the second above; the first recurrent nervure is received near the second transverse cubital nervure, the second near the base of the apical third of the cellule; the transverse basal nervure is interstitial. Abdomen deep velvety black, shining;

the pygidium testaceous, sparsely covered with long black hairs; the epipygium is also testaceous. The spines on the tibiæ and tarsi are longer and stouter than usual; the tarsi are thickly spined on the lower side. The first recurrent nervure is received nearer the transverse cubital than usual, more as in *Salius*. Claws with a small erect tooth.

There is no transverse furrow on the second ventral segment; the tibiæ and tarsi are thickly and stoutly spined. The females and males are similarly coloured. The species comes close to *P. bracatus*, Bing.

Pompilus Campbelli, sp. n.

Niger, denso argenteo-pruinosus; alis fumatis, basi fere hyalinis. ♀.
Long. fere 10 mm.

The lower part of the front, the face, and clypeus densely covered with silvery pubescence, smooth and shining; on the lower part of the front above the antennæ is a distinct, moderately wide, and deep longitudinal furrow. The sides of the clypeus are broadly rounded; the palpi black; mandibles at the base thickly covered with silvery pubescence. Thorax densely pruinose, entirely smooth and shining. Wings from the transverse basal nervure fuscous, with a slight but distinct violaceous tint; the base almost hyaline; the hinder wings hyaline, with the apex smoky; the first and second cubital cellules above are equal in length; the first and third transverse cubital nervures are roundly curved, the second is straight, oblique; the first recurrent nervure is received near the base of the apical third, the second very shortly behind the middle of the cellule. Legs pruinose, especially at the base; the spines and calcaria are black; the apices of the tarsi have a fuscous tint; the claws are rufous. The abdomen has a slight bluish tint towards the apex; the base pruinose; the third and fourth ventral segments with tufts of longish hair; the last ventral segment is bluntly keeled down the middle.

Pompilus implicitanus, sp. n.

Niger, dense argenteo-pruinosus; alis fusco-violaceis, cellula cubitali 1ª longiore quam 2ª. ♂.
Long. 13 mm.

Front and vertex sparsely pilose; the face and clypeus densely covered with silvery pubescence; the upper part of the front indistinctly, the lower half distinctly longitudinally f[illegible]owed. Base of mandibles thickly covered with silvery pubescence, the apex piceous. Thorax densely pruinose, smooth and shining. Legs pruinose, the coxæ white through the white pile, the spines and calcaria black. Wings dark brownish fuscous, with a distinct violaceous iridescence, the base more hyaline, the hinder pair with the hyaline part broader; the first cubital cellule above is shortly but distinctly longer than the second; the first transverse cubital nervure has a distinct rounded curve, the second is straight and oblique, the third has a less distinctly rounded curve than the first; the first recurrent nervure is received at the base of the apical third, the second very shortly beyond the middle; the transverse basal nervure is interstitial. Abdomen pruinose, the middle ventral segments sparsely pilose.

This species agrees closely with *P. Campbelli*; it is larger, has the wings of a much darker and uniform violaceous tint; the third transverse cubital nervure is not so roundly curved, the transverse basal nervure is interstitial, and the ventral segments are not covered with longish hair.

Tiphia khasiana, sp. n.

Nigra, femoribus posterioribus rufis; medio metanoti tricarinato: alis fusco-hyalinis, nervis fuscis, stigmate nigro. ♀.

Long. 11 mm.

Antennæ stout, the scape fringed with long silvery hair; the flagellum covered with a pale microscopic pile; the basal four joints of the flagellum are produced at the apex. Head shining, sparsely covered with long white hair; the front and vertex sparsely punctured except for a broad band below the ocelli; the face and base of the clypeus are closely punctured; the rest of the clypeus is smooth and shining, its apex with a slight, broad, rounded incision. Mandibles broadly rufous in the middle and fringed with long pale fulvous hair; the palpi are dark testaceous. Thorax shining, the basal slope of the pronotum impunctate below, above closely punctured; the apex with two rows of punctures, the basal being the finer; the extreme apex is impunctate. Mesonotum with large punctures; the postscutellum is closely and finely punctured except at the base. Median segment aciculated, most strongly on the basal part; there are three central keels, the inner one does not quite reach to the apex. Propleuræ aciculated; the base is smooth above; there is an oblique furrow near the middle; the part below this is closely striated. The middle of the mesopleuræ is closely punctured and thickly covered with white hair; the base of the metapleuræ is aciculated, the rest closely obliquely striated. The basal half of the mesosternum is punctured; on the apex in the middle is a ∧-shaped depression with a furrow down its middle. Wings hyaline, with a distinct fuscous tinge; the stigma is black; the nervures are fulvo-testaceous. Legs black; the four hinder femora are bright red; the outer side of the tibiæ thickly covered with silvery hair; the spines are rufous. Abdomen shining, the middle and basal segments with two rows of punctures; the apical segments are almost entirely punctured and thickly covered with long white hair; the apical half of the pygidium is rufous and smooth, the basal strongly punctured and covered with long white hair. The upper part of the second transverse cubital nervure is roundly curved, the lower straight.

Comes nearest to *T. cassiope*, Cam., which may be known from it by the apex of the clypeus being transverse.

Tiphia canaliculata, sp. n.

Black, thickly covered with white pubescence, which on the apical abdominal segments has a more fulvous hue; the wings fuscous hyaline, highly iridescent; the stigma and nervures black; the median segment with three longitudinal keels, the apex of the segment depressed and stoutly longitudinally striated. ♂.

Long. 12 mm.

Antennæ black, stout; the scape thickly covered with long glistening white hair; the base of the flagellum with a white pile. Head opaque, closely rugosely punctured, more shining, less closely and more strongly punctured on the ocellar region. Clypeus shining, closely and somewhat strongly punctured; the apex roundly transverse. Mandibles black, their base covered with long white glistening hair. Pronotum closely and distinctly punctured, except on the hinder edge, which is smooth and shining. Mesonotum rugosely, rather closely punctured, except on the sides, which are raised, clearly separated, and become wider gradually towards the apex. Scutellum strongly and deeply punctured, except on the apex and in the middle. Postscutellum closely and strongly punctured, except in the middle at the apex. Median segment coarsely aciculated, with three parallel keels; the outer do not reach to the apex, only to the base of the furrow, which is wide and deep; it is longitudinally striated; the apical slope is coarsely shagreened and bears some indistinct striæ; the ocelli are placed in an oval depression on the lower side at the base. The upper half of the propleuræ coarsely aciculated, the lower closely obliquely striated. Mesopleuræ closely and somewhat strongly punctured and covered thickly with white pubescence. Metapleuræ strongly obliquely striated, the striæ becoming more widely separated towards the apex. Mesosternum punctured, irregularly and widely furrowed in the middle. The alar nervures are fuscous; the second transverse cubital nervure is united to the radius at the foot of the apical abscissa, which is thickened above the junction. Abdomen shining, obsoletely punctured; the apical segments are thickly covered with pale fuscous pubescence; the base of the underside of the petiole has a distinct tooth, which is broadly rounded at the base; the apex is straight and oblique, from it a keel extends to the middle. The apices of the ventral segments are fringed with long dark fuscous hair. Legs entirely black except the lower side of the fore tibiæ; the hair is thick and white; the calcaria and the tarsal spines are pale rufous.

The transverse median nervure is placed shortly behind the transverse basal.

Myzine Rothneyi, sp. n.

Black, the four posterior trochanters, femora, and tibiæ red; the wings fuscous violaceous; the median segment with two keels, which unite before the top of the apical slope, the apex of the segment reticulated.

Long. 18 19 mm.

Flagellum of antennæ fuscous beneath, the scape covered with white hair. Front and vertex rugosely coarsely punctured, the punctures running into reticulations above the antennæ. Mandibles black, dull piceous beyond the middle. The basal part of the pronotum coarsely aciculated, smooth and shining on the apex, and thickly covered with short white hair; the apical part coarsely closely punctured, its basal slope smooth. The base of the mesonotum smooth, impunctate, the apical part with large deep punctures. Scutellum with large, deep, irregular, elongated punctures, all clearly separated; the postscutellum minutely punctured, but not closely. The basal half of the basal part of the median segment closely rugosely punctured, the apical reticulated, punctured; the apical slope bears shallow round punctures, which are sparser in the centre; on the basal part are two keels, which unite before the top of the apical slope. Propleuræ strongly punctured at the base, the middle smooth, the apex closely finely striated, the striæ becoming weaker at the apex. Mesopleuræ coarsely rugosely punctured. Metapleuræ longitudinally striated, the striæ weaker at the base. Wings fuscous violaceous, the hinder pair paler than the anterior; the stigma and nervures dark fuscous; the third transverse cubital nervure is interstitial, with the nervure bounding the top of the radial cellule; the latter is clearly separated from the radius. Legs thickly covered with white hairs, those on the tarsi have a fulvous hue. Abdomen shining, sparsely minutely punctured; the pygidium is more strongly punctured, except on the apex; the ventral surface is sparsely covered with white hair.

A distinct species, not nearly allied to any of those already described. It is one of the largest species.

XIII.—*Some Notes on Nomenclature* [*].

By FREDERICK PICKARD CAMBRIDGE, B.A., F.Z.S.

IN an ordinary way it would not be necessary to make any reply to Dr. Dahl's "One Word more on the International Rules of Nomenclature" (Zool. Anzeiger, Bd. xxv. Feb. 1902), for he considers this to be the last word. Since, however, he asks for some answer to his questions, and has, as he says, taken up his pen for my special enlightenment, it would be uncourteous were I to refuse to return the compliment.

In the first place, Dahl complains that I am upsetting the unanimity which has hitherto prevailed as to the types of genera, and quotes *Gnaphosa*, *Micromata*, and *Salticus* as instances. In the case of the last genus, however, Simon, in the latest part of his Hist. Nat. Araignées, gives *scenicus* as the type; whereas Thorell and nearly all authors, including Simon himself, have hitherto regarded *formicarius* as the type. I might add a few more instances. Thorell gave *sisyphium*, Clerck, as the type of *Theridion*; Simon gives *redimitum*, Linn. Simon restores *Araneus*; Thorell, until quite lately, upheld *Epeira*. Thorell again gives us *lugubris*, Walck., as the type of *Lycosa*; Simon gives us *tarentula*, Rossi. Thorell regarded *mirabilis*, Clerck, as the type of *Ocyale*; Simon gives us *atalanta*, Aud., &c. &c. So much for the prevailing unanimity. But I may be permitted to suggest that Dr. Dahl need not exercise himself over the iniquity of changing a name or two here and there, seeing that, in the case of Clerck, the International Rules have upset thirty or forty names concerning which an absolute unanimity has prevailed amongst authors for quite a century. If we are to swallow this camel, I for one shall not strain at the change of a name or so where necessary in the cause of consistency.

---

[*] *Cf.* Ann. & Mag. Nat. Hist. ser. 7. vol. viii. p. 403 (Nov. 1901).

I might also point out that in other branches of zoology—Aves, Lepidoptera, Coleoptera, &c.—I cannot now recognize by name many of the oldest friends of my youth. But if the change has been necessary in these cases, there is no reason to object to necessary changes in the case of much less popular groups, such as the Araneæ.

The Value of a Definite Type Species.

On the last page of his paper Dr. Dahl says that he considers that the fixation of a type would be of slight practical utility, and he adds :—"So far as I can see, I can distinguish three cases in which the type comes into question: (1) I entirely agree with the founder as to the extent of his genus; (2) I agree with a later author; (3) I have my own view." And Dahl asks me to point out when I consider that a practical difficulty arises which would be avoided by the selection of a type.

I answer at once, *in every case*, namely the practical difficulty of ascertaining what exactly is the view to begin with. Dahl appears to misunderstand the question at issue. ***The practical value of a selected type comes in before we can form any definite view or opinion as to the characters of a genus at all, either to agree with or to differ from.*** We are dealing, for instance, with Latreille's genus *Lycosa*, having before us a number of specimens to classify, many of which we may consider might conveniently be denoted by different group names. We do not wish, however, to coin a number of new names before we have definitely determined that there are no names available which would suit our purpose. We wish for some definite criterion by which we may judge as to which of our specimens belong to *Lycosa*, which to *Tarentula*, *Trochosa*, *Pardosa*, *Arctosa*, *Potamia*, *Hogna*, *Diapontia*, *Tricca*, *Alopecosa*, *Trochosina*, *Learna*, &c. &c. This can only be secured by fixing a single type species to each name. We must determine the type species of *Lycosa* first; and of this genus Dahl insists that we must wait for a future worker to break it up before we can settle on the type, and this worker must further make a new genus of the species under *Lycosa* before his selection will be valid, and so too with all other genera where types have not been cited.

We have waited for nearly a hundred years to ascertain what we mean when we use the generic name *Lycosa*, and if we are to make a new genus every time we want to settle the type of an old one, it seems likely that we shall wait for another century.

On account of Inadequate Diagnoses.

In very many cases, moreover, generic diagnoses contain only characters which apply equally well to the whole *family*; and still more noticeable is the fact that there are often plenty of excellent characters on which genera could be based which were never even observed by the authors who founded the divisions, and do not occur in the diagnoses.

As notable instances of this, one may refer to the minute diagnoses of genera and species made by Dr. Thorell in his study of the Scorpiones. It is not possible to tell from those diagnoses even the *family* to which the species described belonged, because the one character on which the division into families can be satisfactorily based was *overlooked*. So, too, in the case of the Aviculariidæ. The subfamily divisions are now based upon characters of which, except in two cases, the very existence was not noticed—namely, the organs of stridulation.

So that unless there are definite type-species to refer to, it is not possible to make any further progress in systematic knowledge. We continue to muddle on, checked at every point by inadequate diagnoses. But directly we have a type-species selected for each generic name we are in a position to judge of the value of the divisions indicated by those names, and also of others which we may ourselves contemplate. We can refer to the facts and see for ourselves, and we shall not then be making new generic appellations on the strength of newly-discovered characters, when there are probably plenty of names already available, if we could but examine definite types. We want to classify our material according to the facts we find in Nature, not by the concepts to which we are restricted by a study of the diagnoses printed in literature. I may remark, too, that type-species of genera, unless they happen to be unique, can always be freely interchanged, and thus some progress in the science made.

As a concrete illustration of a practical difficulty arising for the systematic zoologist, I would suggest that anyone who doubts the value of definite type-species should secure a collection of 500 species of the Salticidæ, for instance, and endeavour to classify them by the light of original generic diagnoses or by the views and standpoints of later authors. If he does not soon find himself writing to living authors for their *types* and fixing upon types for those who are dead, I shall be very much surprised.

As to whether I or Dr. Dahl agree with or differ from any other author as to the extent of his genus is of absolutely no importance to anyone. Nor are the views, standpoints, or concepts either of the original or any later author of any importance either. We are, happily or unhappily, dealing with names and the definite characters to be connoted by them, and we want these characters permanently attached to one or other name by means of a single type-species, so that we can all, when we wish, go to the facts themselves and understand what we are talking about when we use these names.

Names are the current coin in the realms of systematic zoology, necessary for the interexchange of ideas as to the facts; but until these names have a fixed and definite character-value, chaos can be the only result of using them.

But Dr. Dahl says "*of course everyone is at liberty to choose a type for his own private purposes.*" But authors do not choose types for their private purposes; their selections usually appear in publications, and thus the confusion begins. Students consult these publications in order to ascertain what conception, for instance, they are to form as to a certain genus. There may be four or five authors dealing with a genus of ten or a dozen species, and the student is often confronted with three or four different conceptions of the same genus. Some authors will have made new genera based on other authors' concepts of the original genus, each one taking a different author's concept. Often, too, an author's original concept of another author's genus will itself change in course of time (as in the case of *Salticus*), and students who have been basing new genera upon this author's original conception find that they have been building on a quick-sand. Other authors, totally unable to arrive at any reasonable conclusion as to the original genus at all, and finding that of later authors not one has the same conception, simply ignore the whole question. They then probably make another new genus, when several already exist which would meet the case, if types had been definitely selected; or, still worse, they further increase the confusion by adding to literature yet another concept of the original genus of their own. What we need is a definite type-species for each generic name, so that everyone can go to the fact and find out from it what are the characters which are connoted by that name.

That in which Thorell in Europ. Spid. and Simon in Hist. Nat. Ar. have made so excellent a beginning by selecting types for genera has to be continued, taking care that all types are fixed by one and the same definite process, so that errors in the various steps can be corrected, and the whole science placed upon some solid and definite basis.

The Selected Type.

When we have made up our minds that *type-species* are a necessity in systematic zoology, we shall be in a position to discuss the processes of arriving at this type.

Dr. Dahl quotes three points in which he supposes that the rules I follow differ from those of the International Congress. The third is this: "*Any author, even some time after the establishment of a genus, may fix the type, if the first author has omitted to do so.*" Dahl adds that I seem to assume that the International Rules would be against the process of elimination for the establishment of a definite type. On the contrary, it would never occur to me that any body of rules should contemplate an attitude so illogical, in view of their decision in paragraph 35, that the first author has to ascribe the original name of the genus to that part of it which he considers suitable.

By what *right* do these rules tamper with the original genus at all? Limited in any way, the result cannot be said to be the original author's conception of his genus. And if the exigencies of systematic zoology demand a further limitation to a single species, even an International Congress cannot dispute the right to take that action. But if the International Rules still adhere to the decision that the determination of the author who first breaks up the genus "*cannot afterwards be modified,*" then no type-species can ever be fixed upon in cases where more than one species has been left in by the first author's action.

As to the absence of a paragraph on the point, this simply means that the necessity of fixing on a single type-species never occurred to those who drew up the rules.

I have, however, never heard any reasonable argument against regarding the first definitely selected type-species as "*the type*" to which all may refer when they wish to know what the characters of a genus may be. One might object that a species possibly would be selected which afterwards was found to be congeneric with the type of a previous genus, and so the name would be lost as a synonym. But the same objection applies to the case of an author originally breaking up the genus and limiting it to one species, when he himself founds a new genus out of one or more of the residue. So that this objection is of no importance.

There are three very good reasons for recognizing the definite selection of a type-species:—

(1) Pure elimination, where it leaves us with a single species, is liable to leave us, especially in the case of the older genera, with a phantom species, whose identity is not known and probably never will be known, since all the well-known species have been removed to new genera. The recognition of a type-species, definitely selected by the terms typ, typus, or type, enables us to avoid this contingency.

(2) Where it leaves us with several species, we can never really know what we are talking about, when we refer to a generic name, until the residue has been finally reduced to *one* species.

In the case of *Lycosa* mentioned above, Dahl tells us that the task of settling on a type "remains for the future worker who again breaks up the residue."

This is precisely what I was told twenty years ago, uttered under the auspices of the "International Rules," and we are still awaiting the advent of that future worker who shall inform us, by breaking up the residue left in by elimination and forming a new genus therefrom, what we are to understand when we speak of *Lycosa*, and, I may add, of dozens of other genera left in like predicament.

But we want to know *now* for immediate use, just as we did twenty, fifty, a hundred years ago.

(3) It has just dawned upon me that I myself may be the "*future worker.*" I have before me something like *ten* genera, each consisting of several species, and I wish to fix upon a type for each, because I believe that the species involved may be conveniently broken up into groups distinguishable by a definite name. But, according to the International Rules (sec. Dahl), I must make a new genus out of the residue of each before I can fix upon a type-species. I must found *ten new genera* because I want to fix on the *type* for ten old ones.

But if there is one thing we want to avoid, it is the making of new genera before we know what the old ones are, and we cannot tell what the old ones are until we have definitely fixed their types.

In the case here mentioned, which is not hypothetical, but constitutes a problem really at this moment before me, I believe that the old names will be quite sufficient to represent the groups I have in view, and one does not want to add a lot of useless names to the literature merely for the sake of justifying the selection of types for those already existing.

If, however, I am compelled to do this, I merely found ten *bogus* genera, of no systematic value whatever, by quoting a name and adding a type species.

If the International Rules are ready to vindicate this action, I am afraid I really cannot endorse their decision.

For these reasons then, and there are probably others which one has not foreseen, I look upon the recognition of a type-species definitely selected by a later author as of the highest value in systematic zoology. The action is simple and direct, it saves trouble, enables us to avoid waiting for future workers, prevents the unnecessary multiplication of names, and sets nomenclature now at once, for our own immediate use, upon a fixed and definite basis.

There still remain two points to be noticed, in which Dr. Dahl supposes that my methods differ from those of the International Congress:—

(1) *That a binominal name established before* 1758 *is valid.*

Before Dahl wrote this he should have already received my paper in which I said that I was perfectly prepared to agree that Clerck's names be allowed to lapse, so that this supposition is incorrect.

(2) *The earlier page of the same edition of a work has priority over a later page.*

Thus crudely stated, the point involved is open to misconception.

I hold, and I know of no one else who does not, that a name printed on an earlier page of the same edition of a work, or on an earlier line of the same page, must have priority over the later name, when there is *no doubt* that the species denoted by the two names are identical.

If, for instance, the species represented by *Aranea riparia* and *Ar. labyrinthica* be identical, then the first name *must* stand. If the identity of the two species be not certain, then, of course, the name decided upon by the first author who selected it would stand *for the time being.* But if the type specimen of *A. riparia*, Linn., turned up at Burlington House, as might happen, and proved to be what had hitherto been called *labyrinthica*, then the name *must* be *riparia*, because it occurs earlier on the page than *labyrinthica*.

If this conclusion be contrary to the International Rules, they must be very strange rules.

As to whether, when the type has been lost, the two names are to be regarded as denoting the same species or not, is entirely a matter for mutual discussion between arachnologists, who, if possible, would come to some definite conclusion on the point.

XIV.—*The Morphology of the Madreporaria.*—II. *Increase of Mesenteries in* Madrepora *beyond the Protocnemic Stage.* By J. E. Duerden, Ph.D., A.R.C.Sc. (Lond.), Bruce Fellow, Johns Hopkins University *.

In the 'Johns Hopkins University Circulars' (1900), I refer briefly to the discovery that in the genus *Porites* the mesenteries beyond the primary six pairs (protocnemes) are added in bilateral pairs, within the entocœle of either the dorsal or ventral pair of directives. This method of mesenterial increase is shown to differ from that characteristic of recent corals generally. The results are also briefly contrasted with the method of mesenterial increase occurring in the three great divisions of the Actiniaria—Hexactiniæ, Zoantheæ, and Ceriantheæ. The close resemblance of the polyps of *Madrepora* † to those of *Porites*, with regard to the number and arrangement of the tentacles and mesenteries, suggested that perhaps a similar mode of mesenterial addition might be followed in that genus also, and the present investigation was undertaken to determine this.

In West-Indian waters at least three well-known types of

---

* From the 'Johns Hopkins University Circulars,' vol. xxi. No. 157, pp. 59-66 (April, 1902). For Part I. see 'Annals' for May 1902, p. 381.

† Since the paper was written I have received Mr. T. Wayland Vaughan's reports, "Some Fossil Corals from the Elevated Reefs of Curaçao, Arube, and Bonaire," and "The Stony Corals of the Porto Rican Waters," 1901. Following Brook (1893), Vaughan points out that none of the species at present called *Madrepora* were included within this genus by Linnæus in 1758, and that therefore the name cannot be retained for the forms embraced by Dana, Milne-Edwards and Haime, and later authors. Vaughan suggests its replacement by *Isopora*, a term first employed by Studer in 1878 in a subgeneric sense. More recently Prof. A. E. Verrill (1901) has come to the conclusion that the *Acropora* of Oken (1815) has much better claims for adoption in place of *Madrepora*.

Madrepora colonies are recognized—*M. palmata*, *M. cervicornis*, and *M. prolifera*. The late George Brook (1893) regarded all these as but *formæ* or varieties of one species; Gregory (1895, 1900) at first accepted Brook's suggestion, but, following upon a visit to the West Indies, reverted to the Lamarckian arrangement of the specific distinctness of the three; Vaughan (1901) follows Brook in considering them as only varieties of one species; Verrill (1901) agrees with Brook and Vaughan. So far as my own observations upon the living polyps extend, and upon their anatomy and histology, there are no differences of importance among the three types of growth, and a discussion of their specific recognition or otherwise becomes restricted to the peculiarities of form assumed by the skeleton.

The radial polyps of all the West-Indian *Madreporæ* are characterized by the presence of only twelve tentacles, six entocœlic and six exocœlic, forming a single cycle, and usually varying in size in such a manner as to suggest larval relationships. On almost any colony, whether of the arborescent or palmate type of growth, polyps are occasionally met with which are slightly larger than the others and bear tentacles beyond the usual twelve, any even number from sixteen to twenty-four being represented. As the number of tentacles on any polyp is an indication of the number of internal mesenteries, it was to the polyps possessing more than twelve tentacles that attention was directed.

To procure these for microscopic examination involved considerable labour and care. The polyps of *Madrepora* are so small that the tentacles can only be counted with the assistance of a lens, and then only when in an expanded condition. Among a hundred polyps perhaps only one would display more than twelve tentacles, and on some colonies, especially those living near the surface, no such examples whatever would be found. By carefully chipping around the desired individual it could be isolated on a fragment of the colony of suitable size for study. The polyps were killed in corrosive-acetic or in formol, afterwards transferred to alcohol, then slowly decalcified with hydrochloric acid, and stained and sectionized.

The radial polyps and corallites of *Madrepora* are, as a rule, oval in section, the axial-abaxial diameter being the longer (fig. 1). The polyps with from sixteen to twenty or more tentacles were still more elongated, but with the longer diameter at right angles to the axial-abaxial plane (fig. 7), the tentacles still forming a single uninterrupted cycle all the way round. Two oral apertures were present on the disk of upwards of thirty enlarged examples found; in only one or two doubtful instances was but one mouth remaining. Evidently therefore the increase of tentacles and mesenteries early results in oral fission, if the two, indeed, do not proceed *pari passu.* The plane of fission coincides with the median or axial-abaxial plane, and in some rare instances the two polypal halves appeared to be in process of separation by the ingrowth of the middle tentacles and septa. Increase in the number of polyps in any colony of *Madrepora* by means of fission must, however, be very insignificant compared with the usual increase by cœnosarcal gemmation.

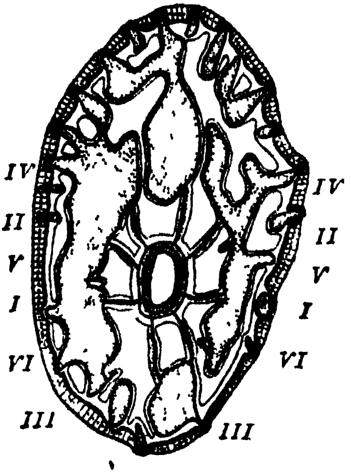


Fig. 1.

Transverse section through the stomodæal region of a projecting radial polyp of *Madrepora*. In relation to the axis of the branch the lower aspect of the section is axial and the upper is abaxial. The two mesenteries, *IV*, *IV*, forming a bilateral pair, are the dorsal directives, and mesenteries *III*, *III* are the ventral directives. Mesenteries *II*, *V* and *I*, *VI* on each side constitute two anisocnemic unilateral pairs. The polypal cavity is in communication with the superficial canals by means of several radiating canals. The outer polypal wall (cœnosarc) is supported upon twenty-four costal ridges.

In this and all the figures the three cœlenterate layers are represented as follows:—The *ectoderm* by the conventional columnar epithelium, the *mesoglœa* by a thick black line; and the *endoderm* as a clear layer. Owing to its narrowness the calicoblastic ectoderm is unrepresented, the skeletotrophic mesoglœa appearing to cover the corallum directly. The skeleton or corallum is indicated by the dotted areas.

The early stage at which oral fission is accomplished in the larger polyps of *Madrepora* is in marked contrast with the same phenomenon in *Porites* [*], for in numerous examples of the latter with tentacles and mesenteries in excess of twelve, often from twenty to twenty-four, I have only come upon one or two instances in which two oral apertures were displayed on a single disk. The problem of mesenterial increase in polyps of *Madrepora* is therefore more complex than in *Porites*, for from the beginning the new mesenteries in *Madrepora* are associated with two stomodæal tubes instead of only one.

A transverse section of an ordinary radial polyp of *Madrepora* through the stomodæal region is represented in fig. 1. Attention will be directed only to the mesenteries. Twelve of these are present, arranged in six bilateral pairs, of which two pairs, *III*, *IV*, situated at opposite extremities, are directives, and two pairs, *V*, *VI*, are incomplete—that is, are not attached to the stomodæum. The retractor muscles are sufficiently well developed on mesoglœal plaitings to admit of the paired arrangement of the mesenteries being established. In the figures the mesenteries are numbered I to VI, in accordance with the order in which the pairs are usually found to appear in the course of embryonic and larval development of both corals and anemones. Throughout their course the fifth and sixth mesenterial pairs never become inserted on the stomodæum, but disappear shortly below the lower termination of the stomodæum, and never bear mesenterial filaments. In Actinological literature the remaining eight complete mesenteries are known as the Edwardsian mesenteries; and the polyps of *Madrepora*, like those of *Porites*, are said to retain in the adult condition the Edwardsia-stage of mesenterial development, a stage passed through in the growth of most Madreporaria and Actiniaria.

Nearly all Madreporarian polyps pass beyond the stage with only twelve mesenteries, usually by the addition of alternating isocnemic pairs within the six primary exocœles, which in the end constitute one or more distinct cycles.

---

[*] In the course of my former investigations on the order of mesenterial increase in *Porites* (1900) no evidence was presented that the additions in the end resulted in polypal fission. From an examination of material collected later it appears that when six new pairs of mesenteries have been formed the enlarged polyp, now possessing twenty-four mesenteries, may undergo division into equal halves, at any rate so far as concerns the oral aperture, stomodæum, and mesenteries. The mesenteries in each daughter polyp are arranged exactly as in ordinary polyps arising as buds. The introduction of fission, however, in no way modifies the morphological significance of the pinnate order in which the increase of mesenteries takes place.

While this is taking place the fifth and sixth primary pairs as a rule become complete. As already mentioned, *Porites* among corals is characterized by the mesenteries beyond the protocnemic stage being added in bilateral pairs, disposed pinnately within either the dorsal or ventral entocœles. Further, the incomplete fifth and sixth pairs never become united with the stomodæum. Figs. 2 and 3, with their explanations, will make these differences clear.

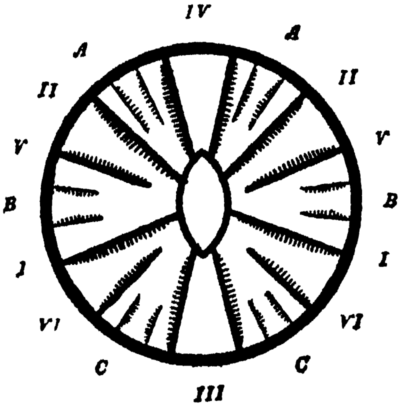


FIG. 2.

Diagram representing the order of appearance of the second cycle of mesenteries in most modern corals. The primary mesenteries, *I–VI*, are in the same condition as in the adult polyps of *Madrepora*, except that the fifth and sixth pairs are nearly united with the stomodæum. Within each of the six primary exocœles a new pair of mesenteries, *A–C*, has appeared, the sequence being represented by the comparative sizes of the mesenteries from the dorso-lateral to the ventro-lateral exocœles. Later all the primary mesenteries become inserted on the stomodæum and the second cycle pairs are equal. Afterwards the third cycle mesenteries arise successively in unilateral pairs within the exocœles between the pairs of the first and second cycles, first on one aspect of the second cycle mesenteries and then on the other aspect, and afterwards become equal in size. Thus several possible regions of growth occur within each primary exocœle, each capable of giving rise to an isocnemic mesenterial pair.

Over a score of the large polyps of *Madrepora* were sectionized transversely. All possessed more than twelve mesenteries, and two stomodæal tubes, divided all the way, were already present; but as regards the mesenterial increase, practically only three different stages are represented, in each of which twenty-four mesenteries already occur at one phase or another of their establishment. The three conditions are represented in figs. 4–6, from camera lucida drawings of actual sections.

The earliest stage obtained is that represented in fig. 4. Twelve complete mesenteries are present and eight incomplete members, all attached to the inner boundary-wall of the polyp. From the disposition of the musculature and the relation of the complete to the incomplete members there is no difficulty in ascertaining which are the primary twelve mesenteries. They are indicated by the same numerals as in the simple polyp. Ventrally they have become widely separated from the dorso-ventral plane which passes through the entocœle of both pairs of directives, but in a symmetrical manner, so that six are on one side and the corresponding six on the other. As yet additional mesenteries are found only on the ventral (axial) side of the polyp, situated within the directive entocœle (*III*, *III*). They consist of two bilateral pairs of complete mesenteries and two incomplete pairs (*A–D*), the lettering not necessarily possessing any significance as to the order in which the mesenteries appeared. Each member of the new outermost complete pair (*A*) forms with the

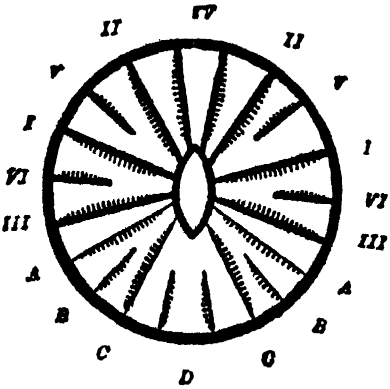


FIG. 3.

Diagrammatic arrangement of the mesenteries in a polyp of *Porites*, showing the manner of increase of the mesenteries beyond the six primary pairs. These latter are indicated by the thicker radial lines, and numbered *I–VI*. Four new bilateral pairs, *A D*, have been successively added at one region within the entocœle of the ventral directives, *III*, *III*, the latter having become pushed far apart (cp. fig. 6). In some polyps of *Porites* the new mesenteries are added within the dorsal directive entocœle instead of the ventral.

primary complete directive mesentery adjacent to it (*III*) a new pair of directives, the musculature being on the faces of the mesenteries turned away from one another; the next incomplete and adjacent complete new mesenteries on each side form a unilateral anisocnemic pair (*B*, *C*), in which the musculature is on the faces turned toward each other, as in pairs *I* and *VI* of the simple polyp. The two members of the middle bilateral pair (*D*, *D*) of incomplete new mesenteries have as yet no corresponding complete mesenteries wherewith to constitute a unilateral pair. The primary dorsal (abaxial) directives (*IV*, *IV*) are somewhat widely separated, but no new mesenteries are intercalated between them.

With the exception of the presence of two stomodæal tubes instead of only one, the disposition of the new mesenteries so far exactly resembles the stage in the mesenterial increase in *Porites* represented in fig. 3.

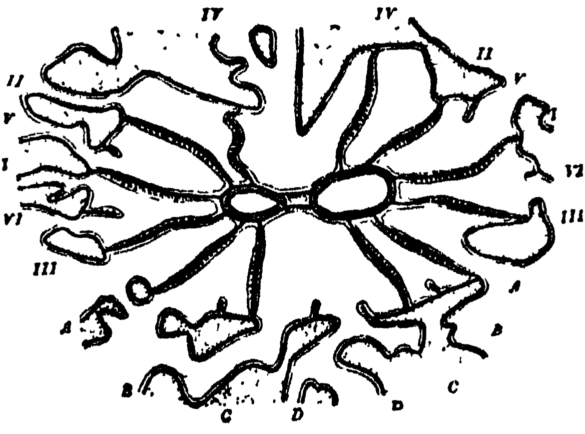


Fig. 4.

Transverse section through the stomodæal region of an enlarged polyp, wholly retracted within the corallum. The stomodæum is divided into two tubes, which are connected by two mesentery-like strands. Four pairs of new mesenteries, *A*–*D*, are present in addition to the six pairs in simple polyps.

Special importance attaches to the two mesentery-like strands which connect the two stomodæal tubes. Sometimes they are short, as in the section represented, or they may be much longer, the stomodæa then being widely apart. For a long time their significance was difficult to understand, and it was only from a study of the early stages in ordinary budding in *Madrepora* that a satisfactory solution of their presence was reached. Full consideration of them will be deferred until later. In the meantime it will be noticed that eight mesenterial insertions—four primary and four new—are associated with each stomodæum, which is the number characteristic of an ordinary adult polyp; also that four incomplete mesenteries belong to each polypal half. Thus, regarding each of the mesentery-like strands as representing two mesenteries, the full complement of twelve mesenteries is associated with each stomodæum, as if the latter were separate polyps.

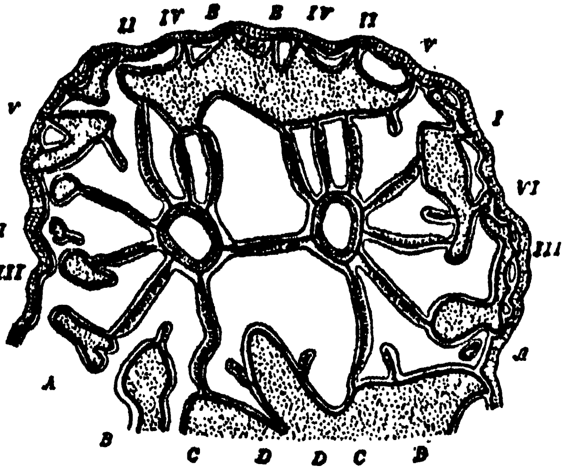


FIG. 5.

Transverse section through the stomodæal region of another enlarged polyp, with the dorsal and lateral areas free. Only a single mesenterial strand connects the stomodæal tubes. New mesenteries, *A*-*D*, have been added within the ventral entocœle, and one pair, *E*, *E*, within the dorsal entocœle.

Fig. 5 displays a further stage in the mesenterial development. There are now seven complete mesenteries extending from each stomodæum to the body-wall, and only a single connecting strand. Evidently the two additional complete mesenteries (*E*, *E*) represent the dorsal member of the two connecting mesenteries in the previous figure. They now form a new bilateral pair situated at the upper aspect of the polyp—that is, within the entocœle of the dorsal directives (*IV*, *IV*), and the musculature is so disposed that the mesentery to the left constitutes a pair of directives with the primary directive mesentery on that side, and likewise with the two on the right side (*IV*, *E*). New mesenteries thus occur at the two axial extremities of the polyp, within both the dorsal and the ventral entocœles, and each stomodæum has associated with it a dorsal and a ventral pair of directives, as in ordinary adult polyps.

Fig. 6 represents the final stage. Eight mesenteries now stretch from each stomodæum to the body-wall, and the two tubes are wholly disconnected. The two additional mesenteries (*F*, *F*) are disposed within the entocœle of the dorsal pair of mesenteries (*E*, *E*) shown to be added in the previous figure, and the retractor muscle is arranged on the faces turned towards each other, so that each mesentery will form an isocnemic pair with the corresponding incomplete mesentery (*D*) on the ventral aspect, a pair comparable with the mesenteries *II* and *V* of the simple polyp. The mesenterial system associated with each stomodæum is now constituted exactly as if each represented a distinct polyp (cp. fig. 1).

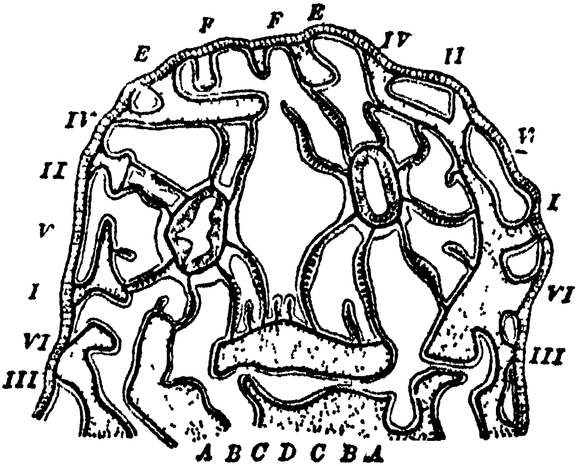


Fig. 6

Transverse section through a third polyp in which the two stomodæal tubes are altogether distinct from one another Four pairs of mesenteries, *A*–*D*, have been added within the ventral entocœle, and two pairs, *E*, *F*, within the dorsal entocœle

The three sections from separate polyps clearly demonstrate that in *Madrepora* new mesenteries beyond the protocnemes are added in bilateral pairs within the primary entocœle of the dorsal directives and also of the ventral directives.

For the disposition of the musculature and the relation of the complete and incomplete members leave no doubt that the mesenteries numbered *I* to *VI* on each side are really the protocnemes of the original polyp, and therefore the four bilateral pairs (*A–D*)—two complete and two incomplete—on the ventral aspect are new pairs which have been added within the entocœle of the primary ventral directives, now pushed widely apart; and similarly with the two bilateral pairs (*E*, *F*) on the dorsal aspect within the primary entocœle of the dorsal directives.

The accompaniment of fission of the stomodæal tube, involving a separation of the mesenteries attached to it into two series, has really no bearing upon the manner of mesenterial succession, which alone is sought to be established. I have already carried out investigations on mesenterial development and stomodæal fission in the West-Indian corals, *Manicina areolata* (Linn.), *Favia fragum* (Esper), and *Mæandrina labyrinthica* (Ell. & Sol.), &c.; but from the beginning the metacnemes in these are added in unilateral exocœlic pairs, as already described for the majority of actinians and corals (fig. 3), and the introduction of fission in no way modifies this method. Fission commences in young polyps of *M. areolata* and *F. fragum* after the third or fourth mesenterial cycle has become established. No new pairs of directives arise in the fission polyps, and the plane of division is not through the directive entocœles as in *Madrepora*, but is usually at right angles to the directive plane.

During the growth of the second cycle of mesenteries in most corals and actinians the fifth and sixth developmental pairs of protocnemes become complete, but this never happens in the enlarged polyps of *Madrepora* nor of *Porites*; the new pairs are also anisocnemic with the exception of those constituting directives.

The sequence represented in the three figures is that characteristic of all the polyps examined, but variations in the number of the mesenteries which may be relegated to either the dorsal or ventral extremity have been met with. Fig. 7 represents a section through a polyp in which three additional pairs (*C–E*)—two complete and one incomplete—are already added dorsally, and only two pairs (*A*, *B*)—one complete and one incomplete—ventrally. In all the examples previously considered no more than two new pairs are placed dorsally, the remaining four being ventral. The connecting pair in fig. 7, whether in the end attached dorsally or ventrally, will separate the two members of a bilateral pair of incomplete mesenteries. From the arrangement of the musculature, and the relationships of the complete and incomplete mesenteries, it is clear that each polyp will, upon separation along the axial plane, possess twelve mesenteries with the paired arrangement exactly as in the adult.

Another polyp exhibited thirteen complete mesenteries with several alternating incomplete members, associated with one stomodæum, while on the other stomodæum were inserted the normal eight. Several large ova were developed in the single connecting mesentery of one polyp, while they were absent from the remaining mesenteries.

We may now return to a consideration of the median mesenterial strands connecting the two stomodæal invaginations. In some polyps two of these are found to extend as vertical partitions throughout the length of each stomodæum, and at the uppermost extremity of the polyp they pass along the narrow central portion of the disk intervening between the two oral apertures. Sometimes only one may be present, extending the whole way; in others the partition has disappeared above, but is complete below; while again, as in fig. 6, both partitions may be wholly absent, each presumably represented by the two distinct pairs of mesenteries (*E*, *E*; *F*, *F*) which stretch from the stomodæum to the dorsal region of the body-wall.

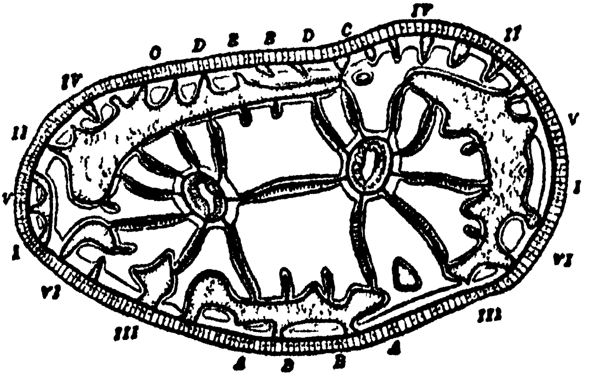


Fig. 7.

Transverse section through a large polyp projecting all the way round from the general surface of the colony. Only two mesenterial pairs, *A*, *B*, occur within the ventral entocœle, while three pairs, *C*-*E*, have been added within the dorsal entocœle.

That each connecting strand actually becomes divided into two mesenteries, and that these effect a union with the vertical body-wall, is clearly shown in the series of partly diagrammatic transverse sections (fig. 8, *A–D*), taken at different

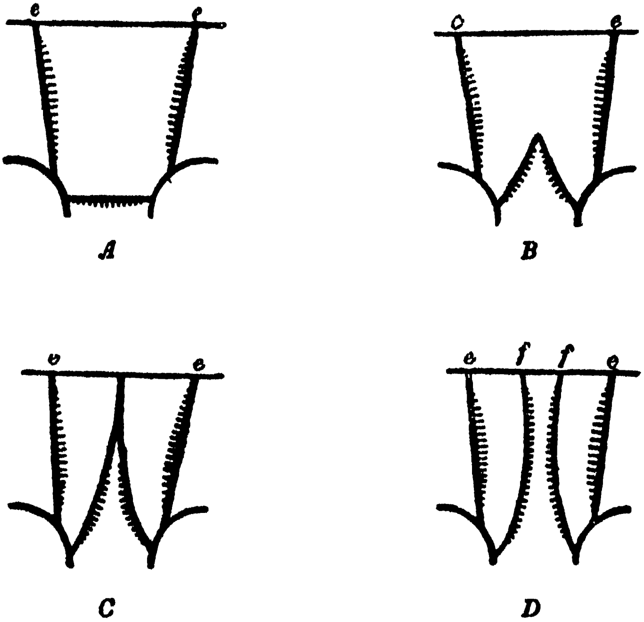


Fig. 8.

Diagrammatic figures taken at different levels from a single polyp to illustrate the manner in which a single mesenterial strand joining two stomodæal tubes becomes inserted on the polypal wall as a pair of distinct mesenteries: *A* is towards the inner termination of the stomodæum, *D* is from the upper extremity of the polyp, and *B* and *C* from intermediate sections.

levels from a single polyp. Fig. *A* is from a section through the lower stomodæal region, where only a single straight mesentery joins the two stomodæal tubes. The dorsal connecting mesentery is already divided, and presumably is represented by the two mesenteries, *e*, *e* (cp. fig. 5). In fig. *B*, taken from a section a little higher, the connecting mesentery is directed in an angular manner toward the dorsal part of the body-wall, and in the next it is actually inserted on the wall; while in the last figure (*D*), from a section near the upper extremity of the polyp, the two halves are altogether apart and appear as two distinct mesenteries, *f*, *f*.

The musculature is strongly developed throughout, whether the mesentery be simple or divided.

From the series of sections it appears that the two connecting mesenteries, which originally pass straight across the portion of the disk intervening between the two oral apertures, first begin to extend from their middle towards the periphery of the disk, and when that is reached each half becomes distinct. The separation then proceeds down the polypal wall, until ultimately the partition is divided throughout, and two mesenteries, each connected with its own stomodæum from the beginning, are now fully established, and in all respects resemble the older complete mesenteries.

The new incomplete mesenteries have a much simpler origin. They are never connected with the stomodæum, but in serial transverse sections can be seen to arise somewhere towards the upper extremity of the polypal wall, and to extend vertically as well as radiately for but a short distance. In no case do they pass downwards as far as the incomplete members of the primary series. In one or two instances I have failed to discover them. The incomplete mesenteries never bear filaments, but the complete mesenteries are all filamentiferous for some distance below the inner termination of the stomodæum. The connecting mesenteries, while still unattached to the column wall, also bear filaments at their free edge.

A knowledge of the early stages of gemmation in ordinary polyps of *Madrepora* assists towards an understanding of the peculiar relationships of the mesenteries during the process of fission. Figs. 9–13 represent a series of sections through a very young polyp from near the apex of a branch of *M. prolifera*. The stage is so early that no tentacles have yet appeared. The bud is formed wholly from the superficial covering of the colony over one of the ordinary peripheral canals, and structurally is entirely unconnected with the older polyps, though in communication with them by means of the canal system. The sections are vertical and are taken from only one side of the polyp, but an exactly similar series is found to occur on the other half.

Fig. 9 is from a section passing through the oral aperture, which has just been formed. The stomodæal walls appear as simple inturnings of the superficial wall of the colony. The section is in the directive plane passing through the two directive entocœles, so that no trace of the mesenteries is included. The two slight elevations of the outer wall are probably the first indications of the axial entocœlic tentacles. The endodermal epithelium of the bud, including that forming

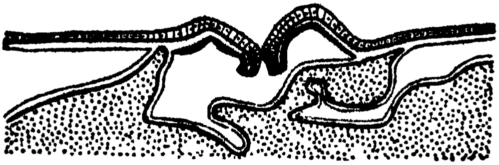


Fig. 9.

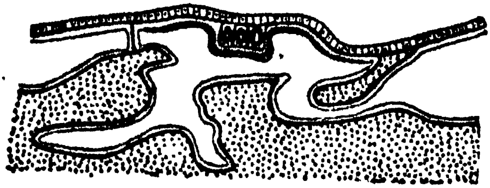


Fig. 10.

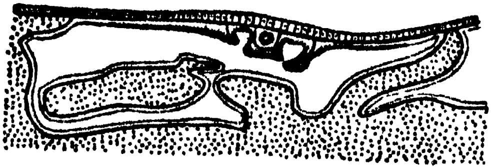


Fig. 11.

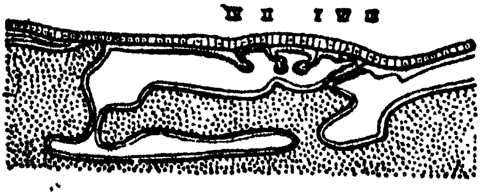


Fig. 12.

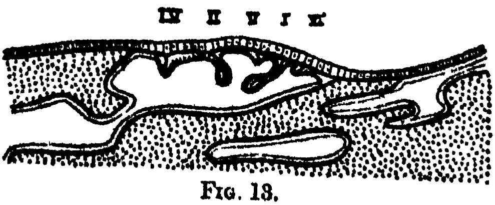


Fig. 13.

Figs. 9–13.—Series of sections illustrating the early stages in the formation of a bud polyp of *Madrepora*.

both the inner and outer lining of the stomodæum, differs altogether from that elsewhere lining the canals and gastric cavity of the polyps; the cells are columnar, strongly ciliated, non-vacuolated, and stain deeply.

Fig. 10 is from a section a little to one side of the oral aperture, and reveals four mesenteries extending vertically from the outer wall as far as the inturned stomodæal wall. In fig. 11 the two outermost mesenteries have become free at their lower extremity, but the two inner still retain their connexion with the infolded margin of the stomodæum. In the next figure all the primary mesenteries are free from the stomodæum, but the one to the right is connected with the inner wall of the peripheral canal. To the left of the mesentery the rudiment of an additional mesentery has now appeared. In the succeeding figure (fig. 13) the mesentery at the extreme right has disappeared and a rudiment of a second new mesentery occurs. Thus all the six mesenteries—four complete and two incomplete—of one side of an adult polyp of *Madrepora* are accounted for.

The important facts in the present connexion which the series of sections serve to demonstrate are as follows:—1. In the formation of a bud of *Madrepora* the six pairs of mesenteries characteristic of the adult polyps are all present at a very early stage, perhaps appearing simultaneously. 2. The four complete pairs arise at or near the angle between the disk and stomodæal wall, and extend all the way down the latter, and also radiate along the outer wall. 3. The two incomplete pairs arise on the body-wall (not yet differentiated into actual disk and column) some distance from the oral aperture, and from the beginning are wholly free from the stomodæum and extend only a short distance.

The above results from the bud-polyps may now be compared with the conditions occurring in the fission polyps of *Madrepora*. That no succession in the appearance of the new six pairs of mesenteries has been met with in the numerous fission polyps examined is evidently due to the circumstance that, as in the bud, all the six pairs appear at a very early stage, if not simultaneously. The presence of mesenterial strands connecting the two stomodæal tubes may be brought about by the close association of the complete mesenteries with each stomodæum at the time of separation of the latter. Obviously from the insertion of the mesenteries at about equal distances all round the stomodæal wall only two adjacent members will be directly opposite each other, and, arising from the same proliferating band of tissue, may grow as single lamellæ down the opposite aspect of each stomodæal wall, and thus for a time remain as partitions uniting the two stomodæal tubes. It is only later, when each single partition begins to extend radiately across the disk and passes down the body-wall, that each strand becomes two distinct mesenteries and the mesenterial system for each polyp is normally established. The early appearance of the incomplete mesenteries and their perfect freedom from the stomodæum in the fission polyps are features likewise reproduced in the young bud polyps.

It has already been mentioned that the number of tentacles on the larger polyps may vary from sixteen to twenty-four, indicating that the passage from the twelve-tentacle stage to the stage with twenty-four is not abrupt. That such a succession should characterize the appearance of the tentacles, though not of the mesenteries, can be easily understood. In the development of corals and anemones it is found that, as a rule, the number of tentacles corresponds with the number of mesenterial chambers, the appearance of new tentacles following very closely upon the formation of additional mesenterial chambers. In the earliest stage of mesenterial addition in *Madrepora* (fig. 4) only eighteen mesenterial chambers are fully established, neglecting the two axial chambers where additions are taking place; thus there would be only as many tentacles. Fig. 5 possesses two additional peripheral mesenteries, hence two additional mesenterial chambers and tentacles. When all the mesenteries are connected peripherally twenty-four mesenterial chambers will be present, affording the possibility of twenty-four tentacular outgrowths.

The enquiry may now be made as to how far the metacnemic sequence characteristic of *Porites* and *Madrepora* conforms with what is already known of the mesenterial development of the Zoantharia generally. The development and anatomy of most modern corals reveal that the metacnemes are added as unilateral isocnemic pairs within the six primary exocœlic chambers, as in fig. 2, and the septa follow a corresponding succession. One, two, four, &c., unilateral pairs may arise successively within each primary system, and in the end become arranged in one, two, three or more cycles. The first cycle of metacnemes consists of six equal pairs, the second of twelve, the third of twenty-four, and so on. The metacnemes, unlike the protocnemes, exhibit perfect radial symmetry when the members of each cycle are fully developed; the presence of two pairs of directives imparts a bilateral character to the six pairs of primary mesenteries. Departures from the hexameral plan are not infrequent in corals, but apparently no form has been described which introduces a different fundamental type of metacnemic succession. The absence of directives and the irregular mesenteric systems described in certain colonial corals—*Lophophyllia*, *Mussa*, *Euphyllia*, &c.—are probably in all cases due to asexual methods of reproduction, and do not indicate the true characteristics such as would be revealed by polyps developed directly from larvæ.

Similarly with modern Actinians, exclusive of Zoanthids and Cerianthids. Their metacnemic sequence conforms most closely with that of modern corals. In many the metacnemes, even of the first cycle, are incompletely established (*Edwardsia*, *Gonactinia*, *Oractis*, *Peachia*), but so far as they go they indicate no new type of development. Dr. O. Carlgren (1897) has lately described an Actinian, *Endocœlactis*, the adult characteristics of which seem to show that the second and third cycles of mesenterics have been added in unilateral pairs within the primary entocœles, the directive entocœles excepted. The discovery is full of suggestiveness in connexion with the entocœlic succession followed in *Porites* and *Madrepora*. Carlgren, however, is inclined to regard the arrangement as merely an exception to the general plan of Hexactinian development, and places the genus under the subtribe Actininæ.

The entocœlic growth of mesenteries and septa is also different from anything which has yet been definitely established among fossil corals, including the Rugosa of Palæozoic times. It must be acknowledged that our acquaintance with the septal succession of extinct corals is very incomplete; a study of numerous types by means of serial sections will be necessary before an adequate knowledge of their method of growth is available. Thanks to the labours of R. Ludwig (1862, 1865) and A. Kunth (1869), we are more or less familiar with the septal plan of a large number of Rugose corals, in so far as this can be determined from the ridges and grooves exhibited on the outer surface of the coralla. According to Ludwig the primary plan in the Rugosa is hexamerous, whereas Kunth assumes a tetrameral condition both for the primary and secondary stages. Both writers find the metasepta to be added successively at four regions, in a manner which finds its expression in what is now known as Kunth's law.

Some of Ludwig's descriptions and figures (pl. xxvii. figs. 2) indicate that new septa were added within all the six primary chambers, while some few septal pairs appear to have been added axially, *i. e.* within an entocœle, as in

Madrepora and *Porites*. The definite establishment of this is a matter of the highest importance.

Recently (1902), I have been able to confirm the observation of Pourtalès (1871) as to the primary hexameral character of the Rugose coral *Lophophyllum proliferum* (McChesney), and by means of serial sections have definitely established the metaseptal sequence. The structure of Palæozoic corals so nearly conforms with that of recent forms as to warrant the assumption that the relationships of the polyp to the corallum were the same as those now thoroughly understood. The metaseptal arrangement in *Lophophyllum* is such as to indicate that the mesenterial additions took place successively at one region only within four of the six primary exocœlic chambers; two of the chambers are the middle exocœles and the other two are the exocœles on each side of one of the axial (directive) pairs of primary mesenteries; no additions were made in the two remaining primary exocœles. So far as the septal arrangement in *Lophophyllum* can be taken as representative of the Rugosa generally, the order is shown to be most closely related to the living Zoantheæ. In this group of mainly tropical and colonial Actinians the metacnemes are added in succession at one region within the primary exocœle on each side of the ventral pair of directives, whereas in the Rugosa they were added in two middle primary exocœles in addition.

With their entocœlic metacnemes, therefore, *Porites* and *Madrepora* cannot yet be brought into conformity with either the extinct Rugose corals or the living Zoanthid polyps, seeing that these are characterized by exocœlic additions. In one feature, however, they all agree. The metacnemes in the Zoantheæ and in *Porites* and *Madrepora* arise successively, a bilateral pair more or less simultaneously on opposite sides of the polyp. In the end they are arranged on each side of the polyp so as to constitute unilateral pairs consisting of a complete and an incomplete moiety (anisocnemic), whereas in ordinary Hexactinians the metacnemic unilateral pairs are constituted of equal moieties which appear together (isocnemic).

The Cerianthids present in their mesenterial growth a method which most nearly approaches that under consideration, though differing in several important details. While Actinian writers such as Boveri and McMurrich hold that the first four pairs of mesenteries to arise represent the four Edwardsian mesenteries, van Beneden (1897) considers that no such relationship can be maintained, and the results of

Carlgren (1897) upon the arrangement of the musculature would seem to indicate the same, as only one pair of directives are represented. The most important characteristic of the Ceriantheæ in the present connexion is that the later mesenteries are always developed within the axial entocœle on the asulcar aspect of the polyp, and that the organs in the adult remain as bilateral pairs. Carlgren has shown that the feeble retractor muscles in each mesentery are always on the face turned away from the directives—that is, the mesenteries do not constitute unilateral pairs in which the faces bearing the retractor muscles are *vis-a-vis*, as in all other Actinians and corals.

The numerous researches of the late H. de Lacaze-Duthiers and those of G. von Koch have demonstrated that the protoseptal stage of many modern corals is hexameral; I have also established the same for several West-Indian species, and a like plan would seem also to have been characteristic of the extinct Rugosa. It is with the appearance of the metasepta that fundamental divergences are introduced. These seem to afford hope that they may serve as a means for arranging the Madreporaria on a more strictly morphological basis than is at present possible. At least three fundamental types are now known:—*a*, the cyclical, characteristic of most modern corals; *b*, the bilateral exocœlic, in *Lophophyllum* and probably other Rugosa; *c*, the bilateral entocœlic, now demonstrated for *Porites* and *Madrepora*.

The essential results may be now summarized:—

1. In most of the polyps of the genus *Madrepora* only the six bilateral pairs of primary mesenteries are developed, of which four pairs are complete and two incomplete. On any colony a few enlarged polyps may possess a greater number of mesenteries. The new mesenteries beyond the primary six pairs are added in complete or incomplete bilateral pairs at only the two axial extremities, the entocœle of the dorsal and ventral directives. The cyclic disposition is never assumed; the directives form isocnemic pairs, but the other pairs are all anisocnemic.

2. The pinnate method of mesenterial increase is distinct from that characteristic of most recent corals; in these the metacnemes are added in isocnemic pairs all round the periphery of the polyp, within the six primary exocœles, and in the end constitute one or more distinct alternating cycles.

3. The method of mesenterial increase beyond the protocnemic stage occurring in *Madrepora* is also characteristic of the genus *Porites*, except that in any one polyp of *Porites* the

Subfamily STROMATEINÆ,

a sacciform processes k from the last branchial arch, 1 15 abdominal and 1 vertebræ, non-protractile premaxillaries, ventral fins rarely .

Genus 1. *Stromat* with ample branchial apertures.
  Subgenus *a.* *romateus*, no pelvic spine.
  „ *b.* *Peprilus*, a trenchant pelvic spine.
  „ *c.* *Poronotus*, a trenchant pelvic spine and a row of vertical slits above the lateral line.
  „ *d.* *Apolectus*, the lateral line keeled posteriorly.
Genus 2. *Stromateoides*, with restricted branchial apertures.
  Subgenus *a.* *Stromateoides*, dorsal and anal spines trenchant.
  „ *b.* *Chondroplites*, dorsal and anal spines concealed, subcartilaginous.
Genus 3. *Psenopsis*, with persistent perfect ventrals.

In 1896 Steindachner* proposed to unite this last genus (type *Psenes anomalus*, Schleg.) with his genus *Parapsettus* (type *Parapsettus panamensis*), which he had previously considered as allied to *Psettus*, but now placed in the Stromateidæ. I have examined *Parapsettus panamensis*, and it appears by no means closely allied to *Psenopsis*, although superficially it ber great resemblance to *Stromateoides*. Dr. Steindachner h n misled by the presence in the œsophagus of numerous c papillæ, which have a similar appearance to the d processes of *Stromateus*, but are soft and fleshy, not confined to the sides of the œsophagus. Similar llæ are present in *Platax*, *Ephippus*, and *Chætodipterus*, ch, together with *Parapsettus*, constitute the family phippidæ, as defined by Messrs. Jordan and Evermann. *Psettus* is not closely related to *Parapsettus*, and belongs to Scorpididæ.

lessrs. Goode and Bean ('Oceanic Ichthyology,' p. 215) te the genera *Icosteus* and *Icichthys* with the Stromateidæ. The affinities of these rare fishes are obscure, but *Icosteus*, which I have examined, certainly does not possess teeth in the œsophagus.

Gill, in 1893 (Nat. Ac. Sci. vi., Mem. 5, p. 115), made a list of the fishes of New Zealand, in which the Stromateidæ are represented by a single species, *Neptotichthys violaceus*, Hutton. Hutton † places this fish in the Carangidæ, and no reason is given by Gill for his alteration. On investigation I find it to be a *Scorpis*, closely allied to *Scorpis chilensis*, Guich.

In the course of attempting to find definite characters by which the so-called Scombriform fishes could be diagnosed, I have discovered that the Stromateidæ must be enlarged by the addition of the following genera:—*Nomeus*, *Cubiceps*, ew mesenteries are disposed at either the one or the extremity, not at both.

---

* Steindachner, Ann. Hofmus. Wien, xi. p. 211 (1896)

† Trans. N. Z. Inst. v. p. 261, pls. viii. & xxii. p. 278.

4. Six new bilateral pairs o[illegible]s appear practically simultaneously in *Madrepora*, bu[illegible] later do they all extend down the polypal wall. In [illegible]es the new pairs follow one another in a regular succession.

5. In *Madrepora* the mesenterial increase is early associated with fission of the stomodæum and in the end probably with complete polypal fission, in which half the mesenteries of each fission polyp are derived from the primary twelve of the original polyp and the other half are new formations. The resulting paired arrangement of the mesenteries, including the presence of two pairs of directives, is exactly as in primary polyps. Fission of the stomodæum appears very late in *Porites*, not until after the full establishment of six new pairs of mesenteries.

(References in No. 155, Jan. 1902; see 'Annals' for May 1902.)

XV.—*A Revision of the Fishes of the Family* Stromat

By C. Tate Regan, B.A.

Since the revision of this family by Gill[*] in 1884, wh considerably enlarged its limits as understood by Günth no additions have been made to our knowledge of its affinit The character which has always been taken as diagnostic o this family is the presence of teeth in the œsophagus, and Günther grouped the fishes which possessed this chara into two genera, *Stromateus* and *Centrolophus*; to these (added the genus *Schedophilus*, placed by Günther in [illegible] Coryphænidæ, the genus *Palinurichthys* (*Pammelas*, Gthr.), placed by Günther in the Carangidæ, and the species *Psenes anomalus* (*Trachynotus anomalus*, Schleg.). Gill subdivided the family thus constituted as follows:—

Subfamily Centrolophinæ,

with complex elongate gill-rakers extending backwards from the epibranchials of the last gill-arch, 11 abdominal and 14 caudal vertebræ, protractile premaxillaries, and normal persistent ventral fins.

Genus 1. *Centrolophus*; body elongate, dorsal spines slender.
2. *Schedophilus*; body ovate, dorsal with 4 short stout spines.
3. *Lirus*; body ovate, dorsal with 6 to 8 short stout spines.

---

[*] Gill, Proc. Am. Phil. Soc. xxi. p. 664 (1884).

[†] Günther, 'Study of Fishes,' p. 452 (1880).

Psenes, *Bathyseriola*, and *Seriolella*, all of which have a toothed œsophagus exactly similar to that of a *Centrolophus*.

The genus *Apolectus* (*Stromateus niger*, Bl.), on the other hand, must be removed from this family, as it lacks œsophageal teeth, and should be placed in the Carangidæ. It can only be separated from those species of *Caranx* with a reduced spinous dorsal and feeble dentition by the disappearance of the ventrals in the adult fish. The pectoral is long and falcate and the lateral line keeled and shielded posteriorly, exactly as in *Caranx*. The ventrals are not jugular, and the young possess two free anal spines and three or four short dorsal spines, which become overgrown with age.

The Stromateidæ may be thus defined:—

No bony stay for the præopercle. Pectoral pterygials regularly hourglass-shaped, the first in contact with the coracoid. Scapula with a median foramen. Second suborbital usually with an internal subocular lamina. Entopterygoid present. Palatine arch attached to parethmoid and preethmoid cornua. A greater or less number of sessile ribs anteriorly, posterior ribs inserted on the transverse processes where these unite to form a closed hæmal arch. Transverse processes directed downwards, epipleural bones variously attached. Two nostrils on each side. Gill-membranes free from the isthmus (except in *Stromateoides*). Pseudobranchiæ present, often rudimentary. Five to seven branchiostegals. Gills four, a slit behind the fourth. Œsophagus with lateral sacs, which are toothed internally. Lower pharyngeals not united. Dorsal fin long, with a more or less distinct spinous portion. Anal with 3 or more spines, long, sometimes as long as the soft dorsal. Ventrals, when present, below or somewhat behind the pectorals, I 5, attached to the abdomen by membrane, depressible in a more or less well-marked groove or furrow. Pelvic bones attached, but not firmly united, to the pectoral arch.

The skeleton is never strongly ossified. The opercular bones are thin, the operculum ending in two flat points, the other opercular bones denticulated or entire. Mouth small or moderate, jaws generally weak, with a trenchant edge, having a single series of small, slender, pointed teeth. Palate and tongue rarely toothed. The shape of the body varies from elongate to deeply ovate. The nostrils are usually nearer the end of the snout than the orbit.

The scales are small or of moderate size, extending on to the vertical fins, generally thin, deciduous, and cycloid. When not deciduous the scales are often pierced by small pores; usually the naked body is covered by pores, which are often minute, sometimes conspicuous. The skull has well-developed muciferous channels and cavities, and during growth the muciferous system seems to extend from the head over the body as a superficial network of canals, this extension being accompanied by the falling off of the scales or else the scales being pierced by pores.

The lateral line is continuous, its scales with a short, straight, and wide tube.

In all the genera it appears that the liver is small, the intestine long, the pyloric appendages in small number, but usually each with numerous small cæca, forming an arborescent mass; sometimes the pyloric appendages are large and simple, and Riggio * has recorded an instance of a specimen of *Centrolophus niger*, in which species this is usually the condition, which had the pyloric appendages excessively branched. This is a good example of that kind of variation which Bateson considers of much importance in the origin of species, and also shows that the character of the pyloric appendages is of no great value in defining genera. The air-bladder is either present or absent.

Most of the fishes of this family are known chiefly from young specimens, which swim freely near the surface in the open ocean, feeding on pelagic Crustacea and the fry of other fish. Larger specimens have been rarely taken at considerable depths, and there seems fair ground for the conclusion that the adult fishes are in many cases inhabitants of the deep sea.

The differences in the vertebral column are best presented in tabular form, and the figures in the various columns represent:—A, total number of vertebræ; B, præcaudal vertebræ; C, præcaudal vertebræ without ribs; D, præcaudal vertebræ without transverse processes, with sessile ribs; E, præcaudal vertebræ with transverse processes and sessile ribs; F, præcaudal vertebræ with ribs on transverse processes; and G, præcaudal vertebræ with closed hæmal arch. H, præcaudal vertebræ with epipleurals on neural arch; K, on ribs; L, on transverse processes; and M, on vertebræ. N, caudal vertebræ.

	A.	B.	C.	D.	E.	F.	G.	H.	K.	L.	M.	N.
Stromateus fiatola	46	23	2	7	0	14	14	2	0	0	21	23
Nomeus Gronovii	41	16	2	2	5	7	7	2	4	0	10	25
Stromateoides cinereus ..	36	15	2	3	0	10	10	2	0	0	13	21
Cubioeps gracilis	33	15	2	7	0	6	6	2	0	0	13	18
Psenes cyanophrys	31	13	2	(4)	(2)	5	5	..	..	..	..	18
Peprilus triacanthus ..	31	14	..	..	..	..	..	..	..	..	..	17
Seriolella porosa	24	10	2	1	5	2	2	2	4	2	2	14
Lirus ovalis	25	10	2	2	5	1	1	2	7	1	0	15
Psenopsis anomalus	24	10	2	3	1	4	4	..	..	..	..	14

---

* Riggio, Naturalista Sicil., Ann. xiii. p. 206 (1894).

It will be seen that there are great differences between the genera, but in all cases the following generalizations apply. A greater or less number of the anterior præcaudals have no transverse processes, and are followed by vertebræ with downwardly directed transverse processes, successively increasing in length, and in the posterior præcaudal region uniting ventrally to form a closed hæmal arch. The two first præcaudals have no ribs and are followed by vertebræ with sessile ribs, which are inserted lower down on each succeeding one, becoming attached ventrally to the hæmal arch when the transverse processes unite.

Throughout this family considerable changes take place during growth, and the non-recognition of this fact has been the cause of multiplication of nominal species. In some genera, e. g. *Nomeus*, *Cubiceps*, the shape of the body changes from short and deep in the young to elongate in the adult; but this does not occur throughout the family. The vertical fins always undergo considerable changes, in most cases being relatively of much greater height in the young, and often during growth they become much more densely scaly, and some of the spines are overgrown and imbedded. The ventral fins are always much longer in the young; the pectorals, on the contrary, are subsymmetrical and rounded in the young, and during growth, owing to the greater elongation of the rays of the upper half of the fin, become asymmetrical and relatively of greater length. Thus the length of the ventrals and pectorals or the height of the dorsal and anal are of little value for systematic purposes, unless the size of the specimen described is given.

Another cause of the multiplication of species on the part of some systematists has been their ignorance of the fact that certain characters regarded as specific are really common to all the species of a genus. Thus, in all the forms with deciduous scales, grooves or furrows, corresponding to the intermuscular septa, are seen on the body; and these have given rise to the specific names of *sulcatus*, *bilineatus*, &c. Also the presence or absence of pores on the body has been taken as a character by which to distinguish between species, their supposed absence being in many cases due to the fact that they cannot easily be detected in all preserved specimens. Generally the first two or three articulated rays of the dorsal are unbranched, and so have been reckoned as spines by some authors.

The genera of this family have in not a few instances been insufficiently diagnosed, and the addition of several which have not hitherto been understood to belong to it suggests the need of a complete revision.

The family as now defined includes the Nomeidæ of Günther, minus the genus *Gastrochisma*; the latter resembles *Nomeus* only in its long ventral fins, depressible into a deep furrow. But as in all the Scombridæ and Carangidæ, as well as the Stromateidæ, the ventrals are inserted close together, more or less widely attached to the abdomen by membrane, and folding back close together into a more or less well-marked groove or hollow, the extreme development of this feature cannot by itself be taken as evidence of genetic affinity.

In all other characters *Gastrochisma* is a typical member of the Scombridæ and must be placed in that family. The single species, *Gastrochisma melampus*, closely resembles in appearance *Lepidothynnus Huttonii*, Gthr.*; and as the correspondence extends to the number of scales, fin-rays, and vertebræ, I have not the least doubt that the latter is only a large example of the former species. The smaller size of the ventrals in the larger fish is paralleled in the genera *Nomeus*, *Psenes*, *Lirus*, &c. As in other Scombridæ, the ribs are inserted at the ventral ends of the hæmapophyses, and it is not impossible that the skeleton of *Lepidothynnus*, described from a photograph, may have been incorrectly set up, as it shows the ribs inserted near the bases of the hæmapophyses. In its compressed body and short gill-rakers *Gastrochisma* resembles *Cybium*, with which it also agrees in the structure of the dorsal fin and the number of vertebræ, whilst the high occipital crest is similar to that of *Coryphæna*.

It has been generally supposed that the teeth in the œsophagus are borne by gill-rakers of the last branchial arch, and throughout the family there are short processes which may be of this nature; but, in addition, the anterior part of the œsophagus has on each side a large muscular sac, which is studded with numerous separate conical or papilliform processes bearing setiform teeth similar to those which occur on the gill-rakers and pharyngeals. In *Stromateus*, *Peprilus*, and *Stromateoides* these lateral sacs are simple and rather elongate; in the other genera they are much shorter and broken up by longitudinal folds into several compartments on each side.

Synopsis of the Genera.

I. Ventral fins present in the adult; œsophagus with longitudinal plications.
  A. Lateral line concurrent with dorsal profile.

---

* Günther, 'Challenger' Pelagic Fishes, p. 15, pl. vi.

a. Spinous dorsal with 10-11 slender spines, at least as high as the soft dorsal.	
Teeth on vomer and palatines	1. *Nomeus.*
Teeth on vomer and tongue at least in the young; body oblong; ventrals behind pectorals	2. *Cubiceps.*
Palate toothless; body ovate; ventrals below pectorals.	3. *Psenes.*
b. Dorsal spines short.	
Maxillary with small supplemental bone	4. *Seriolella.*
Maxillary without supplemental bone	5. *Psenopsis.*
B. Lateral line curved anteriorly, becoming straight before reaching the caudal peduncle.	
Body elongate	6. *Centrolophus.*
Body ovate..................................	7. *Lirus.*
II. Ventral fins absent in the adult, œsophagus without longitudinal plications.	
A. Gill-membranes not joined to the isthmus.	
Pelvis not projecting as a spine	8. *Stromateus.*
Pelvis projecting as a spine	9. *Peprilus.*
B. Gill-membranes broadly joined to the isthmus.	10. *Stromateoides.*

In the following descriptions I have marked * species which are not represented in the British Museum collection. The descriptions of those not so marked are based on specimens in the British Museum collection. I have marked † synonyms which I have been unable to verify.

NOMEUS.

Cuv. Règn. Anim. Ed. i, ii. p. 315 (1817).

Body oblong, moderately compressed, covered with cycloid scales of moderate size. Head scaly except the snout; mouth small; premaxillaries feebly protractile; maxillaries entirely concealed when the mouth is shut, without supplemental bone; teeth on vomer and palatines; opercular bones thin, entire; 6 branchiostegals; gill-rakers of moderate length; pseudobranchiæ well developed; gill-membranes not united, free from the isthmus. Spinous dorsal with 10 or 11 slender spines, the middle spines longest and as long as the longest soft rays, continued on to the soft dorsal, which is long and has the anterior rays highest. Anal with 3 spines, similar to the soft dorsal. Pectorals long, with 23 rays. Ventrals well developed, attached to the abdomen by membrane and depressible in a deep furrow. Caudal forked. Lateral line running high, concurrent with the dorsal profile. Air-bladder present. 41 vertebræ.

This genus apparently consists of one species only, *Nomeus Gronovii*, Cuv. Cuvier and Valenciennes mention a second species, characterized by white ventrals with two dark transverse bands, which they call *N. Peronii*; and this may possibly be identical with *Psenes maculatus*, Lütken, or with *Psenes arafurensis*, Gthr., both of which possess this character.

Nomeus Gronovii, Gmelin.

Full synonymy given by Jordan and Evermann, Fish. N. Am. i. p. 949.

In this species the changes which take place during growth are similar to those which occur in *Cubiceps gracilis*, the body being much deeper in the young, which have shorter and subsymmetrical pectorals and longer ventrals. The ventral fins are inserted distinctly anteriorly to the pectorals in very young specimens, below them in older fish.

D. X–XI, I 25–27. A. III 25–27. Sc. 64–66 $\frac{4\text{–}5}{20\text{–}21}$. Gill-rakers of moderate length, about 18 on the lower part of the anterior arch.

The changes during growth can be best represented in tabular form, the numbers in the various columns representing in millimetres:—A, total length without caudal; B, depth of body; C, length of head; D, length of snout; E, eye diameter; F, interorbital width; G, length of pectoral; H, length of ventrals.

A.	B.	C.	D.	E.	F.	G.	H.
118	30	31	8	8	10	36	27
90	23	23	6	6	8	28	23
70	19	20	5	5·6	6·5	20	20
56	17	17	2·5	5	4·5	15	17
37	11	12	1·6	4·5	3·8	9	13
19	7	7	·8	3	1·8	5	7·5

The scales are deciduous, the body being covered with numerous very small mucous pores.

CUBICEPS.

Cubiceps, Lowe, Proc. Zool. Soc. 1843, p. 82.
Atimostoma, Smith, Ill. Zool. S. Afr., Fish. pl. xxiv. (1845).
Navarchus, Filippi & Verany, Mem. Acc. Sci. Tor. (2) xviii. 1860, p. 7.
Trachelocirrus, Doumet, Rev. et Mag. Zool. 1863, pl. xv.

This genus is closely allied to *Nomeus*, but differs in having shorter ventrals, which are inserted posteriorly to the pectorals, broad coracoids which form a long symphysis causing the thorax to appear cultrate, and a patch of teeth on the vomer and on the tongue at least in the young, whilst palatine teeth are absent. 33 vertebræ. Caudal deeply forked.

Synopsis of the Species.

a. D. XI, I 20–22; A. III 19–20.
Depth of body equal to length of head, $3\frac{4}{5}$ times in total length. Sc. 66 $\frac{6}{22}$ .... 1. *C. capensis.*
Depth of body $4\text{–}4\frac{1}{2}$ times in total length. Sc. 58–66 $\frac{4}{16\text{–}19}$ .... 2. *C. gracilis.*

b. D. X–XI, I 14–17; A. III 14–15.
Pectorals longer than the head .... 3. *C. pauciradiatus.*
Pectorals much shorter than the head .... 4. *C. brevimanus.*

Cubiceps capensis.

Atimostoma capense, Smith, *l. c.*

This species is known only from one specimen, 43 inches long, which is now stuffed and in the British Museum collection. It seems to me probably distinct from *C. gracilis* by the deeper body and greater number of scales in a vertical series.

Depth of body equal to the length of head, 3⅘ times in the total length. Snout as long as the eye, the diameter of which is about 4 times in the length of head. Maxillary not extending to below the eye. Caudal peduncle 1⅔ times as long as deep. D. XI, I 20, the spines increasing in length to the third or fourth, thence decreasing, the soft fin low, the anterior rays produced. A. III 20. Pectorals 1⅓ times as long as the head. Ventrals rather short. Caudal forked, the lobes rather short. Scales 66 $\frac{6}{22}$, still adherent in places and with irregular edges, the naked parts of the body with large mucous pores. Yellowish brown above, light purplish brown beneath; fins reddish brown.

Cape of Good Hope.

Cubiceps gracilis.

Seriola (*Cubiceps*) *gracilis*, Lowe, *l. c.*
Navarchus sulcatus, Filippi & Verany, *l. c.*
Trachelocirrus mediterraneus, Doumet, *l. c.*

Depth of body 4–4⅓ times in total length (3⅓ in very young), length of head 3¼–3⅓ times. Snout shorter than the eye, the diameter of which is 3⅓–4 times in the length of head and equal to the interorbital width. Maxillary extending to vertical from anterior margin of eye. D. XI, I 20–22, the fourth and fifth spines longest; anterior soft rays longest, not as long as longest spines. A. III 19–20. Pectorals 1⅕ times as long as the head, ventrals less than half as long. Sc. 58–66 $\frac{4}{16-19}$, deciduous, numerous minute pores on the naked body. Back and sides brownish purple, light red in the very young, silvery below.

Total length 170 millim.

Mediterranean, Madeira.

Cubiceps pauciradiatus.

Günther, Ann. & Mag. Nat. Hist. (4) x. 1872, p. 423.

Depth of body 4¼ times in total length, length of head 3⅓ times. Snout shorter than eye, the diameter of which is 3 times in the length of head and equal to interorbital width. Maxillary extending to below anterior margin of eye. D. XI, I 17. A. III 14, beginning below the seventh soft ray of the dorsal. Pectorals $1\frac{1}{3}$ times as long as the head, more than twice as long as the ventrals. Sc. 48 $\frac{2\frac{1}{2}}{12}$. Purplish brown, fins lighter.

One specimen, 120 millim. in total length, from Misol, Moluccas.

**Cubiceps brevimanus.*

Klunzinger, Fisch. Roth. Meer. p 116, pl. xii. (1884)

Depth of body about $4\frac{1}{2}$ times in total length, length of head about $4\frac{2}{3}$ times. Snout as long as eye, the diameter of which is 4 times in the length of head. D. X, I 14–15, the first spine $\frac{1}{3}$ the length of the second, which is the longest and equal to $\frac{2}{3}$ the depth of body; soft dorsal low, $\frac{1}{4}$ the depth of body. A III 15, beginning below the third or fourth ray of the soft dorsal. Pectorals $\frac{4}{7}$ the length of head. Sc. 50 $\frac{2\frac{1}{2}}{13}$. Back dark, sides silvery, fins grey, caudal and pectorals white.

One specimen, 800 millim. in total length, from deep water in the Red Sea.

PSENES.

Cuv. & Val. ix. p. 259 (1833).

This genus is distinguished from *Cubiceps* by the shape of the body, which is ovate and strongly compressed, by the absence of teeth on the tongue and vomer in the young, by the ventrals inserted below the pectorals, and by the coracoids, which are not dilated and do not form an elongated symphysis; so that the thorax does not appear cultrate in this genus. Vertebræ 31.

Synopsis of the Species.

D. XI, I 33–34; A. III 34. Body deep and semi-transparent	1. *P. pellucidus.*
D. X, I 25–27; A. III 25–27. Sc. 52–56 $\frac{4-5}{22-26}$. Depth of body about twice in total length	2. *P. cyanophrys.*
D. XI, I 22–23; A III 23. Depth $2\frac{1}{2}$ to 3 times in total length	3. *P. maculatus.*
D XI, I 22; A. III 22. Sc. 47 $\frac{8}{20}$. Depth about $1\frac{2}{3}$ times in total length	4. *P. arafurensis.*
D XI, I 19; A. III 19. L. lat. 55	5. *P. Whiteleggii.*

D. X-XI, I 15; A. III 15. L. lat. 41-43. Scales very deciduous; silvery, purplish above	6. *P. indicus.*
D. X, I 15; A. III 15. Silvery, spotted and mottled with blue	7. *P. regulus.*

**Psenes pellucidus.*

Psenes pellucidus, Lutken, Spolia Atlantica, p. 516, fig. 601 (1880).

Depth of body 2⅓ times in total length, length of head 4 times. Snout shorter than the eye, the diameter of which is 2⅗ times in the total length. D. XI, I 34; A. III 34; vertical fins high; pectorals ⅔ the length of head; ventrals as long as the head. Colourless and semitransparent.

Atlantic.

Psenes cyanophrys.

Psenes cyanophrys, Cuv. & Val. ix. p. 260 (1833).
Psenes javanicus, Cuv. & Val. *t. c.* p. 264.
Psenes auratus, Cuv. & Val. *t. c.* p. 264.
Psenes leucurus, Cuv. & Val. *t. c.* p. 265.
Psenes guamensis, Cuv. & Val. *t. c.* p. 266.
Psenes fuscus, Guichen. Mém. Soc. Sci. Nat. Cherbourg, 1866, p. 138.
Cubiceps multiradiatus, Günther, Proc. Zool. Soc. 1871, p. 661, pl. lxi.

Depth of body 1⅘ to 2⅓ times in total length, length of head 3¼ to 3⅘ times. Snout as long as the eye, the diameter of which is 3¼ to 3⅘ times in the length of head, interorbital width 2⅔ times. Maxillary extending to below anterior margin of eye or a little beyond. D. X, I 25–27. A. III 25–27, the spines increasing in length to the third or fourth, which is the longest, and longer than the highest soft rays. Soft dorsal and anal slightly emarginate, the anterior rays longest. Pectorals longer and ventrals shorter in larger specimens, the former as long as the head and the latter ⅓ of that length in the largest specimen. Sc. 52–56 $\frac{4-5}{22-26}$.

Brownish, with dark parallel lines of dots along the rows of scales. Dorsal, anal, and ventral fins dark brown. Pectorals white. Very young with irregular vertical bands.

Total length 125 millim.

Atlantic and Indo-Pacific.

**Psenes maculatus.*

Psenes maculatus, Lütken, Spolia Atlantica, p. 110 (1880).

Depth of body about 3 times in total length (2½ in very young specimens), length of head 3 to 3⅔ times. Snout shorter than the eye, the diameter of which is 2¼ to 3 times in the length of head. D. XI, I 22 or 23; A. III 23. L. lat. 51.

Yellowish, with 6 or 7 grey-brown vertical bands, which extend on to the dorsal and anal. Spinous dorsal black, soft dorsal and anal with a black marginal line; ventrals black at the base and at the free end, clear in the middle. Pectorals white.

Atlantic.

Psenes arafurensis.

Psenes arafurensis, Gunther, 'Challenger' Pelagic Fishes, p. 13, pl. ii. (1888).

Günther was mistaken in describing this species as having only 7 spines in the spinous dorsal. In his type specimen some of the dorsal spines are broken off short, but it is easy to count 11 dorsal spines, as in other species of *Psenes*. The single specimen known resembles *P. maculatus* in colour, but is distinguished by its deeper body, as is shown by the following measurements:—Total length, without caudal, 30 millim.; depth of body 18 millim.; length of head 12 millim., of snout 2 millim.; eye-diameter 4·5 millim. D. XI, I 22. A. III 22. Sc. $47\frac{3}{20}$.

Arafura Sea.

**Psenes Whiteleggii.*

Psenes Whiteleggii, Waite, Proc. Linn. Soc. N. S Wales, (2) ix. 1894, p. 218, pl. xvii.

Depth of body 2¼ times in total length, length of head 2⅔ to 2¾ times. Snout half as long as the eye-diameter, which is 3 times in the length of head and more than the interorbital width. Maxillary extending to below anterior margin of eye. D. XI, I 19, the third and fourth spines longest, equal to half the length of head, higher than the soft dorsal. A. III 18. Pectorals long, ⅚ the length of head. Ventrals reach the anal. Caudal deeply forked. L. lat. 55.

Delicate salmon-colour, crossed by three brownish transverse bands, the first very broad, extending from the head to the vent, the second narower, connecting the middle rays of the soft dorsal and anal, the third on the caudal peduncle.

Head brown above, silvery below; fins brown.

Total length 47 millim.

Coast of New South Wales.

Psenes indicus.

Cubiceps indicus, Day, Proc. Zool. Soc. 1870, p. 690.
Psenes indicus, Day, Fishes of India, p. 237, pl liv. fig. 2 (1878).

Depth of body 2¼ times in total length, length of head 3 times. Snout ⅓ to ½ as long as the diameter of the eye, which is 2½ to 3 times in the length of head and equal to the interorbital width. Maxillary extending to below the anterior margin of the eye. D X–XI, I 14–15, the fourth and fifth spines longest, equal to half the length of head; anterior soft rays longest, equal to the eye-diameter. A. III 15. Pectorals ⅘ the length of head. Scales very deciduous. L. lat. 41–43. Silvery, purplish above; spinous dorsal dark.

Total length 100 millim.

Coast of Madras.

**Psenes regulus.*

Psenes regulus, Poey, Repert. ii. p. 375 (1868).

Body compressed, regularly oval; mouth small. D. XI 15, the fourth, fifth, and sixth spines the highest. A. III 15. Caudal moderately forked. Scales small, rounded, concentrically striated. Silvery, with blue spots on the sides about as large as the eye; a band passing through the eye.

Total length 90 millim.

Coasts of Cuba.

This species is evidently distinct from *P. indicus*, differing markedly in having adherent scales and in the coloration, and probably in other characters not supplied by Poey's incomplete description, and is entirely different from *Cubiceps pauciradiatus*, which Jordan and Evermann consider to be identical with it.

SERIOLELLA.

Seriolella, Guichen. in Gay, Fauna Chilena, Pisces, p. 238 (1847).
Neptomenus, Gunther, Cat. ii. p. 390 (1860), and Proc. Zool. Soc. 1869, p. 249.

Body oblong or ovate, compressed; mouth moderate; premaxillaries scarcely protractile; maxillary with small supplemental bone, slipping for the entire length of its upper edge under the præorbital; branchiostegals five to seven; gill-membranes united far forward, free from the isthmus; gill-rakers long; pseudobranchiæ reduced and fleshy in the adult; no teeth on the palate; opercular bones thin, with minute denticulations or entire. Scales small, deciduous. Upper surface of head with a spongy porous integument. Lateral line running high, concurrent with dorsal profile. Dorsal fins confluent, with VIII 27–40 rays, the spines short. Anal with III 19–24 rays. Pectorals with 21–22 rays. Caudal forked or emarginate. Vertebræ 24.

In some species pyloric cæca branched, forming an arborescent mass, in others a few simple pyloric cæca.

Synopsis of the Species[*].

A. D. VIII 38-40; conspicuous pores on the body.
  Depth of body 4-4½ times in total length .... 1. *S. porosa.*
  Depth of body 3⅔-3¾ times in total length .... 2. *S. bilineata.*
B. D. VIII 27-31.
  a. Depth of body 2⅔-2¾ times in total length ...... 3. *S. brama.*
  b. Depth of body about 3 times in total length.
    Snout as long as the eye, which is of moderate size. 4. *S. violacea.*
    Snout shorter than the eye, which is large ... .. 5. *S Velaini.*

Seriolella porosa.

Seriolella porosa, Guichen. *l. c.* p. 239, lam. 7
Neptomenus dobula, Gunther, Proc. Zool. Soc. 1869, p. 429.

Depth of body 4 to 4½ times in total length, length of head 3½ to 4 times. Snout longer than the eye, the diameter of which is 4 to 5 times in the length of head, interorbital width about 3¼ times. Maxillary extending to below the anterior margin of the eye. D. VII, I 37–40, the third, fourth, and fifth spines longest, about equal to half the diameter of the eye; the anterior soft rays about ⅔ the length of head. A. III 23–24. Pectorals nearly as long as the head, ventrals half as long. Caudal widely forked. Gill-rakers nearly as long as gill-fringes, about 14 on the lower part of anterior arch. Back and sides bluish grey, silvery below; fins and upper surface of head reddish brown or yellowish brown.

Total length 480 millim.

Coasts of Australia and New Zealand, Pacific coasts of South America, Atlantic coast of Patagonia.

Seriolella bilineata.

Neptomenus bilineatus, Hutton, Tr. N. Z. Inst. v. 1872, p. 261.

Depth of body equal to length of head, 3⅔ to 3¾ times in total length. Snout much longer than the eye, the diameter of which is 5⅓ to 6 times in the length of head, interorbital width 3¼ times. Maxillary scarcely reaching the vertical from the anterior margin of the eye. D. VII, I 38, the fourth spine longest, about ⅔ the diameter of the eye. A. III 24. Pectorals not as long as the head, twice as long as the ventrals. Caudal forked. Gill-rakers about ⅔ the length of gill-fringes, about 12 on the lower part of the anterior arch.

---

[*] *Seriolella cærulea*, Guichen. *l. c.*, is insufficiently described, but does not appear to belong to this genus, and may be a *Lirus*. The body is short, ovate, the depth 3 times in the total length with caudal. Scales very small. Dorsal with 10 stout spines. Pectorals pointed, longer than ventrals. Caudal forked. Deep blue above, lighter below.

Back and sides pale violet, silvery below; tip of both dorsals and inner surface of pectorals blackish.

Total length 170 millim.

New Zealand.

Seriolella brama.

Neptomenus brama, Gunther, Cat. ii. p. 390 (1860).
Neptomenus travale, Casteln. Proc. Zool. Soc. Vict. i. 1872, p. 119.

Depth of body $2\frac{2}{3}$ to $2\frac{3}{4}$ times in total length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$ times. Snout as long as or longer than the eye, the diameter of which is $3\frac{3}{4}$ to $5\frac{2}{3}$ times in the length of head, interorbital width about 3 times. Maxillary extending to below anterior margin of eye. D. VIII 27–31, the spines increasing in length to the fourth and fifth, which are the longest and about equal in length to $\frac{2}{3}$ the eye-diameter in the young; the soft fin emarginate, the anterior rays as long as the postorbital part of the head, the posterior rays half as long in the young, less than $\frac{1}{3}$ as long in the adult. A. III 21–23. Pectorals elongate, falciform, $1\frac{1}{3}$ times as long as the head, twice as long as the ventrals in the young, 3 times in the adult. Ventrals inserted behind the pectorals, more markedly so in the adult. Caudal deeply forked. Sc. 87–100 $\frac{11-14}{25-32}$, deciduous, the naked body with conspicuous pores in the largest specimen only. Lateral line forming a keel on the caudal peduncle. Blue-grey, with a copper tinge on the sides. Upper part of head a brown copper-colour. A broad dark purple vertical band from in front of the dorsal to the point of the operculum. Fins yellowish, inner side of pectorals blackish, ventrals rosy white.

Total length 400 millim.

Coasts of Australia and New Zealand.

Seriolella violacea.

Seriolella violacea, Guichen. *l. c.* p. 241, lam. 7.

Depth of body equal to length of head, 3 times in total length. Snout as long as eye, the diameter of which is $3\frac{4}{5}$ times in the length of head, interorbital width $3\frac{1}{5}$ times. Maxillary extending to below anterior third of eye, not entirely slipping under the præorbital. Præ-, sub-, and inter-opercles minutely denticulated. D. VIII 27, the second spine 3 times as long as the first, the rest subequal, the last rather longer than the rest, the soft rays much longer than the spines, the soft fin highest anteriorly. A. III 19, similar to soft dorsal. Pectorals? Ventrals inserted below the pectorals. Caudal emarginate. Sc. 87 $\frac{12}{28}$. Lateral line following dorsal profile at ¾ the height of the body. Gleaming violet above, silvery below.

Total length 85 millim.

Coast of Chili.

**Seriolella Velaini.*

Seriolella Velaini, Sauvage, Arch. Zool. Exp. viii. 1879, p. 32.

Depth of body 3½ times in total length with caudal (? about 3 times in total length without caudal), length of head 4½ times (? 3¾ times without caudal). Snout shorter than the eye, the diameter of which is 3½ times in the length of head, and less than the interorbital width. Maxillary extending to below the anterior margin of eye. D. VIII 27, spines subequal, short, equal in length to half the diameter of the eye; the soft fin low, the first rays sometimes a little higher than the others. A. III 20, emarginate, the anterior rays twice as long as the last. Pectorals falciform, as long as the head. Ventrals less than half the length of the pectorals and inserted below them. Caudal deeply emarginate. Sc. 90. Lateral line following dorsal profile. Colour?

Total length 690 millim.

Island of St. Paul.

PSENOPSIS.

Psenopsis, Gill, Proc. Ac. Philad. 1862, p. 157.
Bathyseriola, Alcock, Ann. & Mag. Nat. Hist. (6) vi. 1890, p. 202.

Body ovate, compressed, snout truncate; mouth small, no teeth on the palate. Premaxillaries feebly protractile, maxillaries without supplemental bone, entirely slipping under the præorbital. Opercular bones thin, entire or minutely denticulated, branchiostegals seven; gill-membranes united far forward, free from the isthmus; pseudobranchiæ glandular; gill-rakers rather long; scales of moderate size, very deciduous; lateral line concurrent with the dorsal profile. A single dorsal fin, with VI–IX 26–30 rays. Anal with III 22–26 rays. Pectorals pointed, with 22 rays. Ventrals below or slightly in front of the pectorals. Vertebræ 24.

Pyloric cæca arborescent. Air-bladder absent.

Synopsis of the Species.

Depth of body 2¼ times in total length .... 1. *P. anomala.*
Depth of body 3¼ times in total length .... 2. *P. cyanea.*

There can be no question that these two species belong to the same genus, although their relationship has not hitherto been suspected. The dark mucosa which Alcock described as lining the gill-chamber in *P. cyanea* is also to be seen in

P. anomala, and the two species are very closely allied, the chief difference between them being the much deeper body of *P. anomala*.

Psenopsis anomala.

Trachynotus anomalus, Schleg. Faun. Japon., Poiss. p. 107, pl. lvii. fig. 2 (1850).
Psenes anomalus, Blkr. Verh. Bat. Gen. xxvi. 1853, p. 104.
Psenopsis anomalus, Gill, *l. c.*
Parapsettus anomalus, Steind. Ann. Hofmus. Wien, xi. 1896, p. 211.

Depth of body 2¼ times in total length, length of head 3⅔ times. Snout as long as the eye, the diameter of which is 4½ times in the length of head, interorbital width 2⅔ times. Maxillary extending to vertical from anterior margin of eye. Præ-, sub-, and interopercles with minute denticulations. D. V–VI, 29–30, the anterior spines very short and feeble, the last 2 or 3 graduating to the higher soft rays, the soft fin emarginate, the anterior rays twice as high as the last. A. III 26, similar to soft dorsal. Pectorals falciform, as long as the head. Ventrals short, inserted below the pectorals. Caudal moderately forked. Scales very deciduous, about 50 in a longitudinal series. Lateral line following dorsal profile at about ⅘ the height of the body. Dark gleaming purple above, silvery below.

Total length 190 millim.

Japanese Seas.

Psenopsis cyanea.

Bathyseriola cyanea, Alcock, Ann. & Mag. Nat. Hist. (6) vi. 1890, p. 202, and Cat. Indian Deep-sea Fishes, p. 43, and Ill. Zool. 'Investigator,' pl. xviii. fig. 1.

Depth of body 3¼ times in total length, length of head 3 times. Snout a little longer than the eye, the diameter of which is nearly 5 times in the length of head and 1⅔ times in the interorbital width. Maxillary extending to below middle of eye. Præ-, sub-, and interopercles with minute denticulations. D. VIII–IX 24–25, the first 4 or 5 spines short and feeble, the last 2 or 3 graduating to the higher soft rays. A. III 22. The anterior rays of soft dorsal and anal the highest. Pectorals pointed, about ¾ the length of head. Ventrals much shorter, inserted in front of the pectorals. Caudal forked. Scales very deciduous, apparently about 60 in a longitudinal series. Lateral line following dorsal profile at about ⅘ the height of the body. Uniform gleaming bluish black.

Total length 135 millim.

Off Ganjam coast, 98–102 fathoms, and off Godavari coast, 240–276 fathoms.

[To be continued.]

XVI.—*On the Pelvic Fins in the Postlarval and Young Stages of* Onus mustela *(the Five-bearded Rockling).* By DAVID M. PAUL, Gatty Marine Laboratory, St. Andrews.

[Plate V.]

THE young of this form has at different times and by different observers been described as a distinct species, principally on account of the great development of the pelvic fins and the difference in coloration from the adult. The young fish was first described by Couch [*] under the name of "*Ciliata glauca*," the generic name being given on account of the peculiar character of the first dorsal fin. The name "*Ciliata*," however, was already occupied, and Thompson [†] proposed the name "*Couchia*," and this was the term used by Günther in his 'Catalogue of Fishes in the British Museum' [‡]. It was pointed out by Malm, and soon afterwards by Lütken [§], that this was not a distinct species, but merely the young stage of the rockling. In popular language the young fishes are known as the "mackerel midges," because they afford food to large numbers of mackerel and other fishes which follow and prey upon them as they swim in shoals. A similar, if not identical, form was described by Agassiz [||], and its early development studied by him and Whitman [¶]. The early development has been studied in this country by Brook [**], who also gives a short note on the postlarval stages of the allied species *O. cimbria*. In this paper he gives a table showing the sizes of the fish and of its fins at different stages. The postlarval and young stages were also described by M'Intosh [††] and Prince [‡‡], and the former has also a paper [§§] in which he studies in greater detail the later stages in the growth of this species. In all these papers, however, the later development of the pelvic fins has only been touched upon, and more attention has been paid to the changes in size and external appearance than to the structure and function of these fins at different stages in the life-history of the fish.

---

[*] Loudon's Mag. Nat. Hist. vol. v. pp. 15 & 741.
[†] Nat. Hist. Ireland, vol. iv. p. 190.
[‡] Vol. iv. p. 363.
[§] Smitt, 'Scandinavian Fishes,' pt. i. p. 544.
[||] Proc. Amer. Acad. Sci. & Art, vol. xvii. (1882).
[¶] *Ibid.* vol. xx. (1884).
[**] Linn. Soc. Journ., Zool. xviii.
[††] Proc. Roy. Physical Soc. Edinb. vol. x.
[‡‡] Trans. Roy. Soc. Edinb. xxxv. p. 832.
[§§] Scot. Fish. Board Rep. 1896, p. 203.

The present paper is an attempt to give a somewhat more detailed account of this latter part of the subject.

In their young stages many fishes have greatly developed paired fins, while in the adult these are less in proportion. In some cases it is the pectoral fins which are thus hypertrophied, while in other cases it is the pelvic fins. The young gurnards, for example—both the red and grey species—have large pectoral fins, while in the ling the young has huge pelvic fins which become reduced in proportion as the fish grows. In the various species of rockling it is always the pelvic fins which are thus enlarged. The following table gives the length of the body and that of the pelvic fin at various stages; the figures are only what may be called the mean measurements, different specimens varying greatly in the development of the fins. The measurements are all expressed in millimetres, and apply only to spirit-specimens.

Size of fish. mm.	Size of fin. mm.
4·8	1·8
5·5–6·8	2·0
7–8·5	2·5
9–11·5	2·8
11·5–14·5	3·5
16–18·5	4·5
20–25·5	4·1
26	4·2
27–20	4·3

As has been already stated, this development is subject to considerable variation: for example, of two specimens each measuring 11·5 millim. the pelvic fins measured 2·8 and 3·1 millim. That with the longer fin was captured in August and that with the shorter fin in May; but as the rockling spawns from March to December this proves nothing. The condition of the other fins, however, points to the conclusion that the fish with the longer fin was slightly older than the other. The table indicates that the growth of the pelvics is at first extremely rapid, but a point is reached at which an actual reduction in size of the fin takes place. Like all the rest of the development, this feature is extremely variable, but the mean may be taken to lie between 20 and 25 millim., although we may get specimens of 17 millim. whose fins have undoubtedly passed this critical point. Several specimens over 25 millim. have been examined whose fins show no signs of reduction. About this time a change comes over the habits of the fish. It has hitherto been pelagic, but now it betakes itself to the rock-pools and its bluish-green back and silvery sides give place to the uniform brown coloration of the adult.

The fin may now be described at several stages in more detail. In the earliest stage obtained the fish measured slightly less than 5 millim. The fin (of which Pl. V. fig. 1 is a drawing) extends a considerable distance behind the anus; it measures 1·8 millim., *i. e.* rather more than one third of the total length of the fish. The fin-rays are four in number and are of equal length. At the tips they tend to become split up into a number of fine filaments. The pigment in this particular specimen was small in amount and confined to the tip of the fin, the remainder being yellowish. At this stage the pectoral fin is about one third the size of the pelvic and is fan-shaped. The base of the pelvic fin is only very slightly in front of the pectoral at this stage, thereby contrasting with its situation in the adult, where it is considerably in front. This shows that, as in other species, the tendency of the pelvic fins is to shift forward. The epithelium, as shown in transverse section, is thin and undifferentiated; it is not wrinkled between the fin-rays, as in somewhat older specimens, showing that the fin cannot be spread in the form of a fan, as in later stages. The pigment varies greatly in different fins at the same stage; this may be due to individual variation, but more probably because all the specimens examined had been preserved in spirit, some for a considerable number of years. As the young fish grows the pelvic fins increase in length, but still keep the same form. The black pigment becomes more and more confined to the tip of the fin, so that when the fish is 10–12 millim. long the extreme tip of the fin alone is deep black, while the rest is pale in colour. At this stage the fin measures about one fourth of the total length.

Fig. 2 (Pl. V.) represents the fin of a young rockling which was still pelagic, although it had grown to a size of 20 millim. The tips of the fin-rays are not now split, though they are still very long. The number of fin-rays has increased to six, and of these the second is slightly the longer, while the fifth and sixth are short. Sections near the base of the fin at this stage show that it differs from the adult only by the less highly differentiated epithelium. Between the fin-rays the epithelium is now much folded, so that the fin can be spread out like a fan. This is connected with the fact that the fish leads a pelagic life and seeks its food near the surface, the fin being used mainly, if not wholly, as a locomotor organ, while in adult life it is used chiefly as a tactile organ.

As the fish grows beyond this stage the tips of the fin-rays are absorbed, and it is this which gives rise to the shortening of the fin (fig. 3). A transverse section through the anterior portion of the fin is represented in fig. 5, four fin-rays being cut. In this specimen the pigment is very well developed, a complete layer of pigment-cells being present on the side which is directed outwards. The bundles of nerve-fibres are also shown in the section, as well as the undifferentiated character of the epithelium. In the next stage gradual differentiation of the epithelium takes place, accompanied by absorption of the membrane between the first and second and the second and third fin-rays. This is most noticeable in the case of that between the first and second fin-rays. When this process is finished the first ray is free for about one third of its length and the second ray projects about the same distance beyond the tip of the first. The fin-rays themselves become thicker and the extremities are provided with sensory organs. The pigment of the tips, which was so marked in previous stages, is now reduced to a few cells of the usual stellate type (fig. 4). At this stage the free tips are much longer in proportion than in the adult, but as the fish grows the fin becomes deeper and soon acquires the proportions characteristic of the adult.

Adult fin.—Fig. 6 (Pl. V.) represents the fin of a rockling of 98 millim. which was obtained below stones in a rock-pool at St. Andrews. At this stage the fish has all the characters of the larger-sized adults. The fin-rays, of which there were seven, vary in different cases from seven to nine. The former number is more usual, the latter having been only found in one specimen. The last two or three rays are very short. The first is separated from the second, which is the longest, for a considerable distance. Over the surface of the fin are scattered small brown pigment-cells, while near the base occur larger black chromatophores which are visible as small black dots when the fin is viewed through a lens. In transverse section (fig. 7) the following structure is shown:—Centrally are five pairs of dermal fin-rays (*dr.*), above and below each of which lie a pair of nerve-cords (only five pairs of fin-rays are shown, as the section is taken about the middle of the fin, and so does not cut fin-rays 6 and 7). The nerve-cords give off branches to supply the sense-organs, dividing as they proceed towards the tips of the rays, which are more richly innervated than the rest of the fin on account of the greater number of sensory bodies there. The rest of the space is filled up with loose connective tissue in which ramify small blood-vessels. The epithelium consists of the following layers (fig. 9):—Externally is the cuticle, which is composed of small compressed cells. Next is the Malpighian layer, which is composed of long columnar cells having a peculiar beaded appearance, more conspicuous in certain sections than in others. This epithelium is very similar to that on the free rays of the pectoral arch of the gurnard *, and seems to be highly specialized for the purpose of conveying tactile impressions. Below lies the corium, a homogeneous layer without any obvious cellular structure. Beneath this, again, is a layer of fine nerve-fibrils, which supply the sensory organs. A transverse section of a free ray (fig. 8) exhibits the same structure, except that the sense-organs are more numerous and the nerve-supply more highly developed than in the body of the fin. This points to the explanation that the free tips of the fin are mainly used in searching for food, and this is corroborated by actual observation of the living fish.

The sensory organs (fig. 10) have already been described and figured by Bateson † in large numbers of other fishes as well as in the rockling:—"They consist essentially of clusters of long cells arranged together to form a bulb-shaped body, whose apex is not covered by cuticle, but projects upon the surface of the skin." In the rockling the base of the bulb is in contact with the basement-membrane, and through this the nerve enters. In certain other fishes the skin is channelled to receive the nerve. These organs occur in *Onus mustela* on all the barbels, on the pelvic fins, and also on the pectoral fins, on which latter place Bateson does not appear to have noticed them. In the young stages these organs are absent, while in the adult, although they are most numerous at the tips, they occur all over the body of the fin, especially on the first fin-ray. This is connected with a change of habitat, for while the young form is pelagic, the adult lives below stones and in chinks in runlets, and seeks its food at night by feeling along the bottom with its fins spread out at right angles to the body as it swims along. It is possible that these structures may be more than tactile, they may be used for tasting, since when the rockling touches anything in the tank with its fins it seems to be able to distinguish between food-substances and others. For example, Bateson noticed that when a rockling touched a piece of glass or stone smeared with vaseline it turned and examined it, "clearly remarking the peculiar feel of such substances." The rockling usually hunts by smell and not by sight, and when food is put into the tank it does not swim straight towards it, as many other fishes (*e. g.*, cod) do, but rushes wildly about with its pelvic fins spread out at right angles to the body until it brushes against it. The evidence, however, is not sufficient to decide whether these organs are purely tactile or whether they are used in the same way as similar structures in the higher vertebrates.

---

* H. C. Williamson, Scot. Fish. Board Rep. 1803.

† Journ. Mar. Biol. Assoc. 1889-90, p. 225.

My best thanks are due to Professor M'Intosh for his kindness in supplying material and for many helpful suggestions.

EXPLANATION OF PLATE V.

Fig. 1. Left pelvic fin of *Onus mustela*, 5 millim. in length.
Fig. 2. Ditto, 20 millim. in length.
Fig. 3. Ditto, 23 millim. in length.
Fig. 4. Ditto, 32 millim. in length.
Fig. 5. Transverse section of pelvic fin of *Onus*, 23 millim. in length. *ep.*, epithelium; *fr.*, dermal fin-rays; *n.c.*, nerve-cord, *pg.*, pigment.
Fig. 6. Pelvic fin of a specimen 98 millim. in length.
Fig. 7. Transverse section of the foregoing.
Fig 8. Free ray of ditto in section, more highly magnified.
Fig. 9. Epithelium of ditto, high power.
Fig. 10. Sense-organ.

Figs. 1, 2, 3, 4, and 6 are not drawn to scale. The actual size of these is represented by the line underneath each.

Reference letters.

bs. = basement membrane.
ct. = cuticle.
dr. = dermal fin-ray.
ep. = epithelium.
mp. = Malpighian layer.
n.c. = nerve-cord.
s.o. = sense-organ.
t. = connective tissue.

XVII.—*Notes and Descriptions of some* Dynastidæ *from Tropical America, chiefly supplementary to the 'Biologia Centrali-Americana.'* By Gilbert J. Arrow, F.E.S.

I.—*On Central-American Species of the Genus* Cyclocephala.

Although thirty-five described species of *Cyclocephala* are enumerated by H. W. Bates in the 'Biologia Centrali-Americana,' this probably forms scarcely more than a fraction of those actually inhabiting Central America. The British Museum collection already contains about a dozen additional species, and, as certain corrections have to be made to the conclusions expressed in the above work, I have thought it best to prepare a short supplementary paper. I have omitted certain species which it seemed could be more adequately described when further specimens have been received.

The specimens ascribed by Bates to *Cyclocephala mutata* represent four distinct although closely related species, those from Yucatan only being the true *C. mutata* (*C. frontalis*, Burm.). Two of the Costa-Rican specimens belong to *C. sororia*, Bates, while the remainder of the extra-Mexican individuals constitute a new species and those from the northern part of Mexico another.

Cyclocephala marginicollis, sp. n.

Testacea, cylindrica, immaculata, tarsis suturaque tenuissime rufescentibus; capite rufo-fusco, vertice nigro, clypeo lato, vix producto, rugoso (♂ subtilissimo), vertice crebre punctato; prothorace sat lato, nitido, leviter punctato, ubique linea incisa marginato, lateribus fortiter arcuatis, angulis anticis acutis, posticis curvatis; scutello paulo punctato, signa Y-formi vage impresso; elytris grosse lineato-punctatis, ♀ lateribus post medium dilatatis; pygidio, ♂ fere opaco, subtilissime punctato, ♀ subnitido, distincte inæqualiter punctato.
Long. 16–18 mm.

Hab. MEXICO, Cordova, Playa Vicente.

This species and *C. mutata*, G. & H., are extremely close to one another. The true *C. mutata*, however, seems to be confined to Yucatan, from which State it was described. Seven specimens from there in our collection have enabled me to separate the two forms, being entirely devoid of a marginal line at the posterior border of the pronotum, whereas in the new species it is very distinct. The only other differences which I am able to find are the absence in *C. mutata* of the Y-shaped depression on the scutellum, which is more or less visible in the northern form, and the absence of punctures on the posterior part of the head.

Cyclocephala lævicauda, sp. n.

Cylindrica, pallide testacea, elytris pellucidis; capite pygidioque rufo-fuscis, vertice nigro; abdomine, tibiis tarsisque rufescentibus; clypeo lato, vix producto, subtiliter rugoso, vertice mediocriter punctato; prothorace polito, parce et minute punctato, postice immarginato, lateribus valde arcuatis, angulis anticis subacutis, posticis curvatis; scutello vix punctato; elytris lævissime lineato-punctatis, ♀ lateribus post medium dilatatis; pygidio politissimo.
Long. 15–17 mm.

Hab. COSTA RICA, San José, La Palma, Irazu; PANAMA, Chiriqui.

This differs from the two species just distinguished by its more pellucid and lightly punctured elytra and its dark, very smooth pygidium. The thorax is without a posterior marginal line. From *C. sororia*, Bates, to which it has a very close superficial resemblance, it is distinguished by its shorter and broader clypeus, which is not punctured but finely rugose, its less punctured elytra and impunctate pygidium. The females are at once recognizable by the lateral expansion of the elytra, which is absent in *C. sororia*. In the latter species the marginal line of the thorax loses its constancy, our series showing every transition from a complete condition to its entire obliteration behind.

The North-American *C. immaculata*, Oliv., has been recorded by Bates from Cordova in Southern Mexico, on the strength of a single specimen which proves to be specifically distinct, though nearly related. The species must therefore be supposed to range no further southwards than Northern Mexico, a single specimen only having occurred so far south as Lerdo.

The other species is here described:—

Cyclocephala fusciventris, sp. n.

Ovata, testacea, vertice, abdomine, thoracis disco utrinque punctisque elytrorum duobus post medium fusco-rufis; capite crebre rugoso, clypeo magnitudinis mediocre, subtruncato; prothorace sat crebre punctato, linea media lævi, lateribus regulariter curvatis, angulis posticis obliteratis, anticis acutis; scutello punctato; elytris leviter costatis, grosse punctatis; pygidio subtiliter rugoso et setoso.

Long. 12·5 mm.

Hab. S. MEXICO, Cordova.

The dark markings of the upper surface are only faintly indicated in our specimen, but the fuscous abdomen immediately distinguishes it from *C. immaculata*, in which the abdomen is very pale. The pygidium is very coarsely punctured in that species, whereas in the present one it is very finely rugose. The clypeus of *C. fusciventris* is rather larger and the club of the male antenna is less elongate.

Cyclocephala acuta, sp. n.

Testacea, capite, abdomine elytrorumque basi et sutura infuscatis; capite medio rufo-maculato, sat crebre punctato, clypeo magno,

apice acuto; prothorace polito, subtilissime punctato; scutello lævi; elytris lineato-punctatis.
♀ elytrorum marginibus post medium explanatis, fusco maculatis; pygidio acuminato, polito, vix punctato.
Long. 15 mm.

Hab. COSTA RICA, Plains of Corredor.

A single female specimen, found by M. Pittier de Fabrega, has been sent to us. It belongs to the "*signata*" group, but is quite unique from the very peculiar form of its clypeus, which is sharply pointed in front.

Cyclocephala prolongata, sp. n.

Elongata, testacea, capite, prothoracis maculis duabus discoidalibus, sutura maculisque elytrorum nigris; capite elongatissimo, antice crebre strigoso-punctato, postice fere lævi, clypeo antice arcuato, oculis parum prominentibus; prothorace polito, subtiliter punctato, longitudine ad latitudinem æquali, antice valde attenuato, angulis posticis curvatis; scutello vix punctato; elytris haud perspicue punctatis.
♀ pygidio lævi, opaco, medio acuminato; elytrorum marginibus paulo ante apices plicatis, indentatis.
Long. 15 20 mm.

Hab. BRITISH HONDURAS.

We have received a number of specimens of this at different times, all of them females, the greater number having been collected by the Rev. J. Robertson. This also is a quite isolated form, although belonging to the same group as the last. The remarkable elongation of the head and thorax is not found in any other species I know, and the conical prolongation of the pygidium, which will probably be found to characterize the female sex only, is also very peculiar. The black vittæ on each side of the middle line of the prothorax appear to be almost constant, but the elytral ornament is extremely variable. In most of our specimens this consists, in addition to the narrow sutural line, only of a small spot on each side below the scutellum; but these may enlarge and unite into a large triangular patch enclosing the scutellum, while an outer bar may appear extending obliquely inwards from the humeral callus.

Cyclocephala discicollis, sp. n.

Testacea, fronte, prothorace (lateribus exceptis), abdomine elytrorumque vittis quatuor (2 superioribus externis, 2 inferioribus internis) infuscatis; capite strigoso-punctato, clypeo lato, apice angulariter emarginato; prothorace nitido, sparse punctato,

lateribus æqualiter curvatis; scutello punctato; elytris sat grosse punctatis: ♀ elytrorum marginibus post medium explanatis, infuscatis; pygidio punctato-rugoso: ♂ pygidio opaco, subtilissime rugoso et setoso.
Long. 13 mm.

Hab. PANAMA, La Chorrera; VENEZUELA.

A specimen of this from Reiche's collection bears the unpublished name of *discicollis*. The species belongs to the same section of the genus as those just preceding. It is closely related to *C. microspila*, Bates, another Panama species, which M. Biolley has recently sent from Costa Rica. *C. discicollis*, however, has the clypeus more distinctly emarginate, is a trifle smaller, and considerably more marked with brown. The four elytral marks, reduced to dots in *C. microspila*, form elongate dashes, the suture is dark, and in the female the marginal expansion of the elytra also. The pronotum, with the exception of the lateral margins and probably an occasional pale middle line, is dark and the abdomen is tinged with brown.

Cyclocephala sparsa, [sp. n.]

Breviter ovata, testacea, capite nigro, prothorace elytrisque omnino nigro-sparsis, clypeo parvo, arcuato, fusco-rufo; capite prothoraceque crebre at distincte punctatis, hoc valde transverso, angulis anticis acutis, posticis obliteratis; scutello punctato; elytris confluenter punctatis, punctis inæqualibus; pygidio rugoso-punctato, subtiliter setoso: ♀ elytrorum margine post medium leviter angulato, haud explanato.
Long. 14 mm.

Hab. MEXICO, Playa Vicente.

A single female from Playa Vicente was acquired by Messrs. Godman and Salvin from the Sallé collection, and a pair of the same species from "Mexico (Secata)" have been since 1854 in the British Museum. It is related to *C. 14-punctata*, Mann., but is peculiar in having the thorax and elytra splashed irregularly with small black spots. Among these are more or less distinguishable six larger spots upon the elytra, forming with the scutellum an almost perfect circle. The single female in our collection is more thickly speckled than the two males. The front tibiæ are armed with two acute terminal teeth, situated close together, and a third placed before the middle, which is very minute but separated by a very deep notch.

II.—*A Revision of the Genus* Lycomedes *and its Allies.*

Three of the six species hitherto assigned to *Lycomedes* are Central American, while of the ten members of the group now known to me all appear to be confined to the mountain chain between Nicaragua and Ecuador; for, although *L. Mniszechi*, Thoms., was recorded as from Mexico, it has only since been found (by Belt) at Chontales in Nicaragua, and from the restricted range of the other species and the describer's failure to give a precise habitat for the original specimen, this may be regarded, I think, as only an approximation to the actual home of the species.

My attention was first called to the necessity for a revision of the genus by Mons. René Oberthür, who pointed out to me that the form assigned by Bates in the Central-American monograph to *Lycomedes Mniszechi*, Thoms., was distinct from that species, of which the type is in the Oberthür collection. M. Oberthür has since kindly sent me all his specimens of the group, and as I have thus had before me the types of all the described species (all but the one just mentioned being in our own collection), it has seemed to me advisable, while re-characterizing the Central-American forms, to tabulate the distinctive features of all. In so doing I have found all the species range themselves into two very distinct series, for which two generic names are already in existence.

The typical species of *Lycomedes* (*L. Reichei*) was described in 1844 by De Brême, and three years later Burmeister published a description of an insect which he regarded as De Brême's species and which he received from Dupont with the unpublished name of *luridipennis*. Another large male he saw in the Hope collection, and to this he attached the name *Spodistes luridipennis*, Burm., under which he originally described the species, but substituted that of *Lycomedes Reichei* before publication. Upon examination of the last-mentioned specimen, I have found that it is entirely distinct from *L. Reichei*, and very near, but not the same as, that described shortly afterwards by Thomson. These two, with the two others figured in the 'Biologia Centrali-Americana,' form a generic group for which it will be convenient to retain the name *Spodistes*.

In tabulating the characters of the subdivisions of the Dynastidæ, Lacordaire has distinguished the Agaocephalinæ, to which these insects belong, by the absence of a prosternal process. In *Lycomedes* proper this is really strongly developed, but in the species which I associate under the name of *Spodistes* (none of which were known to Lacordaire) it is entirely absent. Associated with this feature is the form of the thoracic horn. In *Lycomedes* it is vertical or even directed somewhat backwards, and is not pointed, but broad and more or less compressed from back to front. It is channelled down the middle, so as to appear as if formed from two fused lateral horns. The prothorax in both sexes is very transverse.

In *Spodistes* the horn is directed horizontally forward, as in the other allied genera, is curved, and tapers to a point. The prothorax in the male is considerably narrower than the elytra.

This genus forms a connecting-link therefore between *Lycomedes* on the one hand and *Agaocephala* and *Mitracephala* on the other. From the last it differs chiefly by the velvety clothing of its upper surface and the narrowed prothorax of the male.

The following are the most salient features of all the species of *Lycomedes* and *Spodistes* yet known to me: —

Genus LYCOMEDES.

Cephalic horn toothed at base:	
basal tooth large, bifid	*ramosus*, sp. n.
basal tooth small	*Reichei*, De Brême.
Cephalic horn bilaminate at base:	
legs velvety	*velutipes*, sp. n.
legs pilose	*hirtipes*, sp. n.
Cephalic horn unarmed at base:	
bifid at apex	*Burmeisteri*, Waterh.
trifid at apex	*Buckleyi*, Waterh.

Genus SPODISTES.

Cephalic horn toothed near base:	
simple at apex	*beltianus*, Bates.
bifid at apex	*Batesi*, sp. n.
Cephalic horn unarmed at base:	
bifid at apex	*Mniszechi*, Thoms.
trifid at apex	*Hopei*, sp. n.

Lycomedes ramosus, sp. n.

Griseo-olivaceus, fusco-nebulosus, velutinus; cantho oculari acuto producto; elytris subdepressis, latis, vix perspicue punctatis, nebulosis, callis apicalibus prominentibus; pedibus partim velutinis, longe flavo-setosis.

♂, capite cornu valido, ramoso, extremitatibus utrisque bifidis, thorace cornu erecto, brevi, canaliculato, munitis; pronoti lateri-

bus sinuatis, post medium valde angulatis, angulis anticis acutis, posticis fere rectis.
Long.* 30 mm., lat. 17 mm.

Hab. COLOMBIA, Bogota.

A single male specimen was included in the collection bequeathed to the Museum by the late Philip Crowley, and is the only representative of the species at present known. It is the finest of its genus, both from the great development of its doubly-branched cephalic horn and the conspicuous marbling of its upper surface. The prosternum is raised into a basin-shaped structure behind the coxæ.

Lycomedes velutipes, sp. n.

Rufo-fuscus, fulvo-griseo-velutinus, vix variegatus; elytris subdepressis, lineato-punctatis, callis apicalibus haud prominentibus, cantho oculari truncato producto.
♂, capite cornu valido, fortiter bifurcato, baseos lateribus laminato elevatis, thorace cornu valido, oblique erecto, antice et postice haud profunde canaliculato, munitis; pronoti lateribus post medium fortiter angulatis, angulis anticis acutis, posticis obtusis; femoribus tibiisque velutinis, parce flavo-setosis.
Long. 32 mm., lat. 19 mm.

Hab. ECUADOR, Chimbo, La Chima.

This species was found by M. de Mathan, from whom M. Oberthür received four specimens. By the latter's kindness it is now represented in our collection. It is a closely allied form to the Colombian *L. Burmeisteri*, Waterh., but the cephalic horn is stouter and more strongly bifurcated, with its edges raised at the base into two parallel ridges. The elytra are less diversified in colour and their puncturation is more apparent. The prosternal process also is more strongly developed. In *L. Burmeisteri* it is only slightly prominent and forms a conical tubercle thickly clothed with hairs. In *L. velutipes* it is produced considerably beyond the coxæ and is trumpet-shaped and naked.

Lycomedes hirtipes, sp. n.

Minor, rufo-fuscus, fulvo-griseo-velutinus; elytris variegatis, irregulariter punctatis, callis apicalibus prominentibus; tibiis tarsisque haud velutinis, longe fulvo-setosis; cantho oculari acute producto.

---

* The length of these insects is measured from the front margin of the clypeus to the extremity of the abdomen, the cephalic horn being excluded.

♂, capite cornu valde curvato et bifurcato, basecs lateribus paulo elevatis, thorace cornu mediocre, oblique erecto, munitis; pronoti lateribus sinuatis, medio valde angulatis, post medium leviter excisis, angulis anticis minute productis, posticis obtusis.

Long. 27 mm., lat. 15 mm.

Hab. COLOMBIA (*Sallé*), Manizales (*Patino*).

This species was labelled *L. Reichei* in the Sallé collection. It is closely allied to that form as well as to *L. Burmeisteri* and *L. velutipes.* The first, in addition to the acute tooth at the base of the cephalic horn, has a pinkish tint, which distinguishes it from all others. The pygidium is also very protuberant and the apical callosities of the elytra are acute. The latter, though less prominent in *L. hirtipes*, are more so than in either of the two other species mentioned above, from both of which the present species is also distinguished by the clothing of its legs, which is not velvety, but thickly hairy. The cephalic horn has its edges elevated at the base, but much less so than in *L. velutipes.* Both sexes may be distinguished also by the elytra, which are variegated and irregularly punctured. The prosternal process is prominent and formed as in the preceding species, but is less expanded and hollowed at its extremity, the edges of which are thickly pilose.

I have seen about a dozen specimens of this species.

Spodistes Batesi, sp. n.

Rufo-fuscus, fulvo-griseo-velutinus, haud variegatus; cantho oculari haud producto; elytris subdepressis, haud perspicue punctatis, callo apicali prominente; corpore subtus pedibusque (tarsis exceptis) omnino velutinis, parce setosis.

♂, capite cornu bifido, intus canaliculato, basi plus minusve dentato, thorace cornu gracili, acuto, antice directo, munitis; pronoto angusto, lateribus postice fere parallelis, latitudine elytrorum dimidio æquali.

Long. 28 mm., lat. 16 mm.

Hab. PANAMA, Volcan de Chiriqui.

The numerous examples of this collected by Mr. Champion were confused by Bates with *L. Mniszechi*, Thoms., of which the Godman-Salvin collection contained a single male specimen from Nicaragua. This specimen agrees exactly with Thomson's type, and both differ from the Panama form by their broader thorax, the acutely produced ocular canthus, and the entire absence of any inner tooth on the cephalic horn. This tooth is formed in *L. Batesi* at the lower extremity of a slight channel upon the inner face of the horn. The channel is visible in all conditions of development of the horn, and although Bates states that in the least-developed specimens the tooth disappears entirely, there is always a slight prominence to mark the termination of the channel. The prosternum, as in all the forms which I have referred to *Spodistes*, is not elevated behind the coxæ. The figure in the Biol. Centr.-Amer. is useless for the recognition of this species.

Spodistes Hopei, sp. n.

Rufo-fuscus, fulvo-griseo-velutinus, haud variegatus, cantho oculari minute obtuse angulato; elytris subdepressis, vix perspicue punctatis.

♂, capite cornu valido, apice bifido, ante apicem intus dentato, thorace cornu acuminato, curvato, haud longo, munitis; pronoto paulo lato, lateribus antice et postice convergentibus.

Long. 33 mm., lat. 19 mm.

Hab. COLOMBIA, New Granada.

The type is the specimen in the Hope Collection referred to by Burmeister under the name of *Lycomedes Reichei*. As already mentioned, Burmeister's description does not apply to that species, and it is even possible that the specimens from the Hope and Dupont collections, from which his description was formulated, are not specifically the same, as a tooth is mentioned at the base of the cephalic horn, whereas in the Hope specimen it is situated a little before the apex. In all other respects Burmeister's description applies to this form. I have seen in M. Oberthür's collection a second male specimen which formerly belonged to M. Sallé.

It will be of interest to describe here a second species of the closely-allied genus *Brachysiderus*, as it appears to indicate an even nearer relationship with the foregoing genera than has been hitherto supposed. The type specimen of this genus is now in M. Oberthür's collection, but through his kindness I have been able to compare it with a female of the same species in our collection and with the type of the following description:—

Brachysiderus paranensis, sp. n.

Rufo-fuscus, elytris testaceis, sutura, marginibus extremis callisque humeralibus et apicalibus infuscatis; cantho oculari extus acuto angulato; prothorace grosse punctato, lateribus irregulariter curvatis, angulis posticis distinctis; scutello grosse rugoso; elytris crebre punctatis, interstitiis vix punctulatis.

♂, capite cornu curvato, bifurcato, apicibus haud divergentibus, armato, prothorace antice medio minute bituberculato; pygidio tumido, nitido, irregulariter punctato.
Long. 31 mm., lat. 18 mm.

Hab. Brazil, Castro (Parana Prov.).

A single male specimen in our collection and an almost identical one in that of Mr. O. E. Janson were collected by Mr. E. D. Jones. The species is similar to *B. quadrimaculatus*, Waterh., in form and coloration, but the cephalic horn is not perceptibly narrower at the base than at the apex, the canthus is not produced forwards, but outwards, there is a rudiment of a thoracic horn, and the thorax is uniformly dark in colour. The disc is much more coarsely punctured than in the other species, and the elytra do not show the thick interstitial puncturation of that form.

XVIII.—*Notes on the Classification of Teleostean Fishes.—III. On the Systematic Position of the Genus* Lampris, *and on the Limits and Contents of the Suborder* Catosteomi. By G. A. Boulenger, F.R.S.

That extraordinary-looking pelagic fish, the Opah or Kingfish (*Lampris luna*), which, from its great size and brilliant colours, always excites much curiosity when landed on our coasts, has hitherto invariably been placed not far from the Mackerels, Scombridæ, or, at least, in the division Scombriformes. Although attention has repeatedly been drawn to the many points in which this fish differs from all Scombriformes, even the most advanced of recent reformers of classification, whilst expressing their doubts as to the propriety of maintaining it in that division, have not ventured to depart from a tradition based solely upon resemblances of the most superficial kind.

An analysis of the characters of *Lampris* at once shows a combination which should exclude it not only from the Scombriformes, but also from the suborder to which that division belongs. The fins are absolutely devoid of spines, the ventrals are abdominal in position and formed of a great number of rays—15 to 17 *,—the mouth is bordered by the maxillaries in addition to the præmaxillaries, if not to a great extent, at least quite as much as in the Scombresocidæ, this combination of characters indicating a very low position among the Physoclists. Besides, the general appearance of the pectoral arch is altogether unique, and the misinterpretation of the morphological value of its elements is no doubt the reason why the true systematic relations of this fish have so long been overlooked.

---

* We have to look back to the Ganoids and the lowest Teleosteans (Elopidæ and Albulidæ) to meet with anything like so high a number.

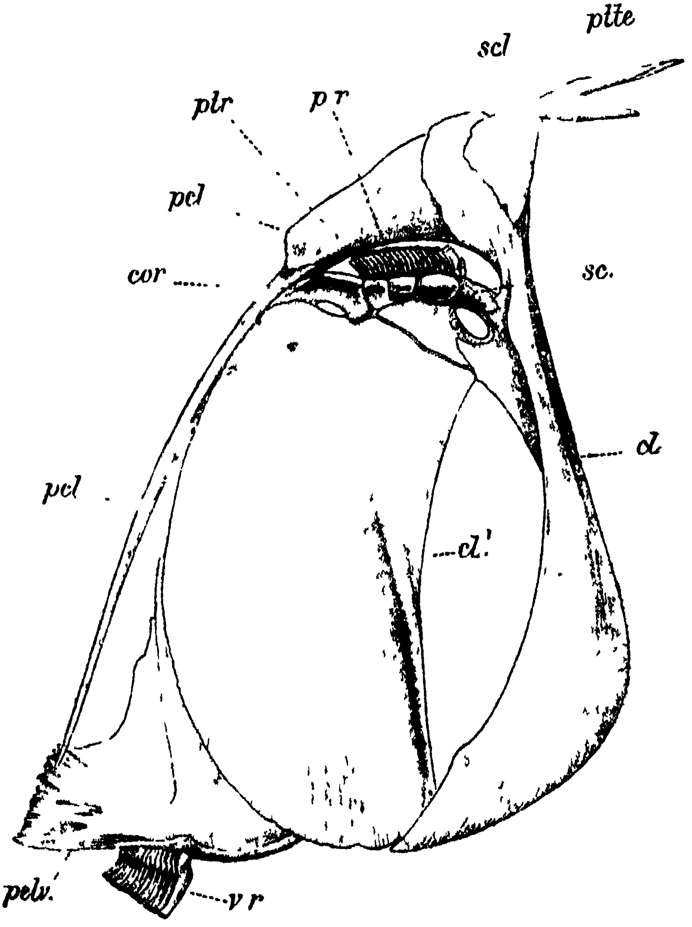
In all the descriptions of the skeleton which have been given since the well-known memoir of Bakker[*] the very large bone to which the pelvis is attached has been identified as the coracoid (or a synonymous element), the bone above it being the scapula, to which four short bones (or, rather, three, the anterior being fused with it) are attached, these being regarded as the basals or pterygials of the pectoral fin. We would thus have a condition, unique among Teleosteans, of the pelvic bone articulating with the coracoid at a considerable distance from the clavicle. Therefore the really "abdominal" position of the ventral fin has been questioned by some authors, in the same way as the state of things in the Sticklebacks was discussed before the homologies of the elements of the pectoral girdle had been realized. On examining the shoulder-bones on a skeleton of *Lampris luna*, I was struck by two things—first, that the disposition of the articulating facets of the pterygials allows of a much greater downward than upward movement of the rays of the pectoral, by which the fin can be pressed down close against the sides of the body, and precludes the opposite vertical position—a fact which I have been able to verify on a specimen in the flesh. This mode of articulation seems so contrary to our ideas that most figures[†] and stuffed specimens represent the pectoral fin directed upwards, as in a *Brama*, to which the Opah was believed to be related. Secondly, that the posterior of the supposed pterygials does not support rays and is altogether unlike a pterygial, whilst its resemblance to a much reduced coracoid is at first sight obvious. That it is not a pterygial is conclusively proved by the fact, which I have ascertained at the suggestion of my friend Prof. Howes, that it is synchondrosially united with the scapula and the large bone hitherto named coracoid by cartilage, whilst only ligament intervenes between the true pterygials and the bones of the primary shoulder-girdle. If, therefore, this be the coracoid, the large bone between the scapula, the clavicle

---

[*] 'Osteographia Piscium; Gadi præsertim Aeglefini, comparati cum Lampride guttato, specie rariori.' Groningen, 1832.

[†] Those of Gunnerus, Norsk. Vid. Selsk. Skrift. iv. 1768, pl. xii.; Sowerby, Brit. Miscell. pl. xxii. (1834); and Smitt, Scandin. Fish. p. 123 (1893), are correct, being based on fresh specimens.

(cleithrum of Gegenbaur), and the pelvis is not that element ; it can be nothing but the bony plate regarded as infraclavicle (clavicle proper of Gegenbaur) in the Teleosteans allied to the Gastrosteidæ (Hemibranchii of Cope). It may be observed



Pectoral arch and pelvis of *Lampris luna.*

cl., clavicle (cleithrum); *cl.'*, infraclavicle (clavicle); *cor.*, coracoid; *pelv.*, pelvis; *p.r.*, pectoral rays; *ptr.*, pterygials; *ptte.*, post-temporal; *sc.*, scapula; *scl.*, supraclavicle; *v.r.*, ventral rays.

that, whilst in *Gastrosteus* the so-called infraclavicles appear on the surface of the body, and might be regarded as parts of the exoskeleton, the same bones in *Aulorhynchus* are covered by the ventral muscles. Among the lower Teleostomi the bones named clavicles proper by Gegenbaur, the morphological significance of which is not open to doubt, are superficial dermal bones in *Polypterus* and Sturgeons, whilst in the Dipneusti they ossify round the primary cartilage of the shoulder-girdle. Therefore, even if the "infraclavicle" of *Lampris* should prove to ossify from the coraco-scapular primary cartilage, this would be no insuperable obstacle to its homology with the clavicle (infraclavicle), which, as we know from the Mammalia, is not always a true membrane-bone *. It would only show that in *Lampris*, in consequence of the great development of the pectoral region, the bone has evolved further than in any other fish.

If this identification of the elements of the shoulder-girdle of *Lampris* be conceded, all difficulties from the systematic point of view disappear at once. The Opah must be regarded as more nearly allied to the Hemibranchii than to any other group of fishes with which we are as yet acquainted. But it possesses important features indicative of both greater generalization and specialization which require the establishment for its reception of a division of at least equal importance with the Hemibranchii and Lophobranchii, and for this division I propose the name Selenichthyes. The close relationship existing between the Hemibranchii (Sticklebacks and Pipe-Fishes) and the Lophobranchii (Needle-fish and Sea-horses), realized long ago by Kner and Steindachner † and by Cope ‡, are now being admitted on all sides §; Dr. A. S. Woodward || and Dr. Swinnerton ¶ have independently proposed to unite them into one suborder, the former using the term Hemibranchii in an extended sense, the latter proposing the new name Thoracostei, "expressive of the presence in all [Hemibranchii and Lophobranchii] of a more or less complete bony armature, and especially of infraclavicles." Unfortunately neither of these names would be appropriate for the suborder after the addition of the Lamprididæ, in which the branchial apparatus is complete and the dermal

---

* *Cf.* Gegenbaur, Vergl. Anat. i. pp. 207 & 496 (1898).

† Denkschr. Ak. Wien, xxi. 1862, p. 28.

‡ Tr. Amer. Philos. Soc. (2) xiv. 1871, p. 457.

§ On the difference in the structure of the gills, *cf.* the recent work of A. Huot, Ann. des Sci. Nat. (8) xiv. 1902, p. 197, who shows that there is no fundamental difference, only one of degree, between the so-called tufted gill and the normal type, and that at a certain stage of development the disposition of the branchial lamellæ is the same in a *Syngnathus* and in an ordinary Teleostean.

|| Catal. of Fossil Fishes, iv. p. 369 (1901).

¶ Quart. Journ. Micr. Sci. xlv. 1902, p. 580.

bony armature absent. I therefore feel compelled to propose a new name to embrace the four divisions Selenichthyes, Hemibranchii, Lophobranchii, and Hypostomides, and have chosen that of Catosteomi (*κατά*, *ὀστέον*, *ὦμος*), in allusion to the additional bone under the shoulder-girdle, which can only be identified with the infraclavicle or clavicle proper of Ganoids and Crossopterygians, and which distinguishes the group from all other Teleosteans. I may add, in further support of the affinity of *Lampris* to the Hemibranchii, that the palatine bone has the single attachment to which attention has first been drawn by Dr. Swinnerton (Acrartrete type).

The diagnostic characters of the suborder Catosteomi and its minor groups are expressed in the following synopsis :—

CATOSTEOMI.

Air-bladder, if present, without open duct. Parietal bones separated by the supraoccipital. Pectoral arch suspended from the skull; no mesocoracoid arch; clavicle (infraclavicle) distinct from the cleithrum. Ventral fins abdominal, if present.

I SELENICHTHYES. Præoperculum and symplectic distinct; branchial apparatus fully developed, gills pectinated; mouth terminal, toothless; post-temporal forked, articulated to the skull; pelvic bones connected with pectoral arch; ventral fins with 15 to 17 rays; ribs long, sessile; fins without spines .... 1. *Lamprididæ.*

II. HEMIBRANCHII. Præoperculum and symplectic distinct, latter much elongate; branchial apparatus more or less reduced, gills pectinated; post-temporal simple, immovably attached to the skull; mouth terminal.

A. Mouth toothed.

1. Pelvic bones connected with pectoral arch; spinous dorsal represented by isolated spines.

Snout conical or but slightly tubiform; ventral fins with one spine and one or two soft rays; ribs slender, free; anterior vertebræ not enlarged......... .... 2. *Gastrosteidæ.*

Snout tubiform; ventral fins with one spine and four soft rays; ribs flattened, ankylosed to lateral bony shields; anterior vertebræ not enlarged .... 3. *Aulorhynchidæ.*

Snout tubiform; ribs slender, free; first vertebra enlarged .... 4. *Protosyngnathidæ* *.

---

* Includes a single form, the Tertiary *Protosyngnathus sumatrensis*, which has been referred without adequate grounds to *Aulorhynchus* or *Aulicops.*

2 Pelvic bones not connected with pectoral arch; ventrals without spine, with 5 or 6 rays; snout tubiform; first vertebra very elongate, formed by the fusion of several.

Isolated dorsal spines; body scaly .... 5. *Aulostomatidæ.*

No dorsal spines; body naked .... 6. *Fistulariidæ.*

B. Mouth toothless; snout tubiform; two short dorsal fins, the first with a few spines; ventral fins with 3 to 5 rays; anterior vertebræ elongate.

Body covered with bony shields and small rough scales .... 7. *Centriscidæ.*

Body completely cuirassed by bony shields which are fused with the endoskeleton .... 8. *Amphisilidæ.*

III. Lophobranchii. Præoperculum absent; symplectic much elongate; branchial apparatus more or less reduced; gill-lamellæ reduced in number and enlarged, forming rounded lobes; post-temporal simple, immovably attached to the skull; mouth toothless, at the end of a tubiform snout; body covered with bony plates.

Two dorsal fins; ventral fins present, with 7 rays; gill-openings wide; exoskeleton of large star-like plates .... 9. *Solenostomidæ.*

A single dorsal fin; no ventral fins; gill-openings very small; exoskeleton in the form of rings .... 10. *Syngnathidæ.*

IV. Hypostomides. Præoperculum and symplectic absent; gills pectinated; mouth inferior, toothless; body entirely covered with bony plates; ventral fin with 2 or 3 rays .... 11. *Pegasidæ.*

XIX.—*Descriptions of Two new South-American Apodal Batrachians.*

By G. A. Boulenger, F.R.S.

Cæcilia Thompsoni.

Teeth very large in front, 6 or 7 in the upper jaw, 15 or 16 in the lower jaw, 14 vomero-palatines on each side; 8 small inner mandibular teeth. Snout rounded, very prominent, as long as the distance between the eyes, which are very indistinct; tentacle on the lower surface of the snout, nearer the edge of the mouth than the nostril. Body cylindrical, very elongate, its diameter 90 times in the total length; 212 circular folds, most of them narrowly interrupted on the dorsal and ventral regions, the last 36 complete and with incomplete intermediate ones. Blackish, speckled with yellowish on the sides.

Total length 1170 millim.; greatest diameter of body 13.

A single specimen from Villeta, Colombia, altitude 3500 feet, collected by Mr. Kay Thompson.

This species is allied to *C. gracilis*, Shaw, but differs in the larger teeth and in the lower position of the tentacle.

Rhinatrema peruvianum.

Teeth small; both rows of mandibular teeth well developed. Snout rounded, scarcely prominent, a little shorter than the distance between the eyes, which are distinguishable. Body rather strongly depressed, with 379 very distinct complete circular folds, 28 of which are on the tail. Anal opening longitudinal. Tail strongly compressed, rounded at the end, a little longer than the head. Uniform dark brown, anal region whitish.

Total length 280 millim.; greatest diameter of body 12.

A single specimen from the Marcapata Valley, E. Peru, collected by Mr. G. Ockenden.

This species is intermediate between *R. bivittatum*, Cuv., from Cayenne, and *R. bicolor*, Blgr., from Colombia and Ecuador. It differs from the first in the longer compressed tail *, from the second in the more obtuse tail and the more numerous annuli on the body, from both in the absence of a yellow lateral band.

XX.—*Description of a new Cyprinodontid Fish from Eastern Peru.* By G. A. Boulenger, F.R.S.

Orestias tirapatæ.

Body compressed, its depth equal to the length of the head, which is 3¾ to 4 times in the total length. Width of head equal to its depth; crown slightly convex; snout obtuse, as long as the eye; mouth small, cleft to the level of the lower border of the eye; lower jaw not projecting beyond the upper; teeth very small; eye supero-lateral, its diameter 3⅔ to 4 times in length of head, 1⅓ to 1½ in interocular width; scales on head imbedded in the skin, which shows very distinct lines of sensory pores. Dorsal with 14 or 15 rays, originating at equal distance from occiput and from root of caudal. Anal exactly opposed to dorsal, with 15 or 16 rays. Pectoral ⅗ to ⅔ length of head. Caudal truncate. Caudal peduncle 1½ as long as deep. Scales thin, imbricate, with concentric striæ, 31 to 33 in a longitudinal series, 12 to 15 in a transverse series; belly and axillary region naked. Brownish above, with more or less numerous darker spots and dots and a blackish lateral streak; belly white; dorsal and caudal fins dotted with blackish.

---

* My colleague Dr. F. Mocquard, of the Paris Museum, has kindly supplied me with the following measurements of the type specimen:—Head (to occiput) 9 millim.; length of tail 2; vertical diameter of tail (at base) 2·75; horizontal diameter of tail (at base) 3·5.

Several specimens were collected by Mr. G. Ockenden at Tirapata, Eastern Peru, at an altitude of 13,000 feet. The largest female with mature ova measures only 65 millimetres.

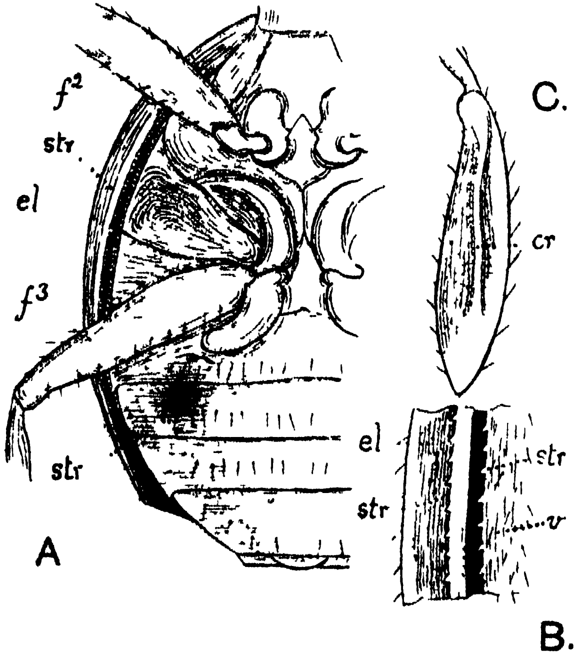
In its small size this new species approaches *O. elegans*, Garman, in which the eyes are nearer together (one diameter apart), the origin of the dorsal fin is nearer the occiput than the root of the caudal, and the scales are smaller (34 to 36 in a longitudinal series) and so thin as to be hardly visible, according to Dr. Garman's description.

This species departs less than any other of the genus *Orestias* from the normal Cyprinodont pattern, and but for the absence of ventral fins would be taken for a *Fundulus*.

XXI.—*The Stridulating-organ in the Egyptian Beetle,* Graphipterus variegatus. By R. I. Pocock.

Some six or seven years ago Mr. Erskine Nicol told me that there is a spotted ground-beetle in Egypt which makes an audible scraping sound as it runs over the sand. I supposed from his description that the insect belonged to the Carabid genus *Anthia*; and knowing that Mr. C. J. Gahan was collecting facts for a paper upon the stridulating-organs of the Coleoptera, I suggested that an examination of *Anthia* might bring to light a new organ of this nature. No such organ, however, could be found; and there the matter was allowed to rest. In July of the present year, however, Mr. J. E. Nicol brought to me, with some Arachnids and insects collected at El Khanka, near Cairo, a specimen of *Anthia* and two other beetles of the smaller but allied form *Graphipterus variegatus*, Fabr. Pointing to the latter, he said, "That is the beetle that makes the noise, not the large kind. When running, it sounds as if it were hollow and partly filled with grains of dry sand."

Microscopical examination at once showed the position and structure of the organ that causes the sound. It consists, on the one hand, of two finely toothed or serrated ridges on each side of the body, one running along the admedian edge of the lateral inturned area of the elytron, the other along the adjacent edges of the sterna of the abdominal somites (figs. A, B, *str.*); and, on the other hand, of a smooth angular crest traversing the postaxial side of the femur of the third leg, and lying in a general way parallel to the long axis of this segment (see fig. C, *cr.*). This crest is not a



Stridulating-organ of *Graphipterus variegatus* (Fabr.).

A. Ventral surface of right half of abdomen and of posterior somites of thorax. f^2, f^3, femora of second and third legs; *el.*, inturned edge of right elytron; *str.*, serrated stridulating-crests on elytron and adjacent margins of abdominal sterna.

B. Piece of the right elytron (*el*) and of one of the abdominal sterna (*v.*), with adjacent serrated stridulating-crests (*str.*).

C. Postaxial side of femur of third leg, showing the smooth crest (*cr.*).

sharply defined upstanding ridge, but resembles rather an angular elevation, such as would be produced by pinching up the horny integument of the femoral segment. A similar but weaker crest is also developed upon the distal portion of the corresponding surface of the femur of the second leg.

The points of the denticulations on the elytra and abdominal sterna are directed obliquely outwards and backwards, so as to cause the greatest friction and produce the loudest sound when the ridges of the femora are scraped against them with the forward stroke of these segments *.

No mechanism exactly resembling this in structure and situation has yet been figured and described in the Coleoptera. The nearest approach to it is to be found in the Cicindelid genus *Oxycheila* and the Heteromerous genus *Cacicus* †, both of which stridulate by scraping the femora of the legs of the posterior pair along the lateral area of the elytra. In these instances, however, the organ consists of a transversely striated crest on the elytra and a similarly striated strip of the integument of the postaxial side of the femora. Again, the striated crests on the elytra are lateral in position in *Oxycheila* and *Cacicus*, not inferior, as in *Graphipterus*. The position of the crests in the latter is correlated with the expansion of the elytra and of the abdominal segments without any corresponding expansion of the mesosternal and metasternal sclerites of the thorax, so that during progression the femora of the second and third legs work in a plane more nearly approaching the horizontal than the subvertical plane in which those of *Oxycheila* and *Cacicus* move.

That *Graphipterus variegatus* is capable of stridulation is no new discovery. To many travellers and residents in Egypt it is probably a matter of everyday observation, and so long ago as 1832 an account of it was published by M. Lefebvre ‡. According to this author, *G. variegatus* was to be met with in the hottest part of the day. At night it could not be found, in spite of diligent search. It lived on the sand-hills, and was abundant in the localities it frequented.

---

* With the help of Mr. C. J. Gahan and Mr. G. J. Arrow I have ascertained that this organ is present in most of the North-African species referred to *Graphipterus* and absent in those assigned to the same genus from South Africa. The former also have a peculiar type of coloration, not exhibited by the latter, which probably indicates a life amid sandy surroundings.

† C. J. Gahan, Tr. Ent. Soc. London, 1900, p. 448, pl. vii. figs. 8, 8 *a*.

‡ Ann. Soc. Ent. Fr. i. p. 311. I am indebted to Mr. C. J. Gahan for this reference. Lefebvre's account was apparently unknown both to Darwin and to Landois, if we may judge from the absence of all reference to it in the former's 'Descent of Man' (1883) and the latter's 'Thierstimmen' (1874). To this defect in the last-mentioned historical account of sounding-organs is presumably to be traced the oblivion in which Lefebvre's observations have seemingly rested since the time of Lacordaire.

It was more easily heard than seen, on account of the tolerably distinct stridulation, resembling the word *xéxé* continually repeated, which it produced by rubbing the inner side of the femur of the posterior legs against the edges of the elytra which border the abdomen. When several were shut in a bottle, they speedily tore each other to pieces with a fury greater than that of all other Carabidæ.

This account contains many observations of interest. In the first place, the author, although apparently unacquainted with the structure of the stridulator, noticed that the sound proceeded from friction between the posterior femora and the elytra. In the second place, the statements as to the abundance, ferocity, and fearlessness of the beetle in roaming abroad in midday and advertising itself by stridulation point to the conclusion that the species is protected and that the stridulation has the same function as that commonly assigned to similar sounds emitted by scorpions, "Mygales," rattlesnakes, and other poisonous or nauseous animals. This opinion is strengthened by the equal development of the organ in the two sexes, which precludes the likelihood of its primary use as a sexual stridulator helping the male to find the female or *vice versâ*. Anyone accustomed to handling Carabidæ, and familiar with the extreme offensiveness of the odour so many of them give out under provocation, will readily appreciate the cogency of the argument in favour of the distastefulness of *Graphipterus*, seeing how intimately connected in ourselves are the sensations of taste and smell. The shining black or metallic hue so characteristic of the Carabidæ and rendering them such conspicuous objects is perhaps correlated with this offensiveness, and acts as its advertiser.

On the other hand, there can be no doubt, I think, that *Graphipterus* is protectively coloured, the black and white speckling of its dorsal surface being admirably suited to harmonize with the mottled tint of the sand in which it lives; and the expanded and somewhat flattened shape of the abdomen suggests that when the necessity for concealment for capture of prey or escape from enemies supervenes, the beetle sinks into the sand, leaving only the upperside of its body exposed on the surface.

The combination of procryptic coloration with aposematic characters is by no means uncommon in the animal kingdom. The cobra furnishes an instance amongst snakes *, and the Indian Mygale known as *Pœcilotheria* amongst spiders. The latter is spotted and banded with grey and brown on the dorsal side, to harmonize with the colouring of the lichen-patched tree-trunks it frequents; but when attacked it starts into a characteristic attitude of defence, raising its anterior legs and palpi to display the black and yellow slashes of their underside, and stridulates at the same time, as a double warning to enemies to keep aloof.

---

* Wallace, 'Darwinism,' p. 202.

XXII.—*On* Marmosa marmota *and* elegans, *with Descriptions of new Subspecies of the latter.* By OLDFIELD THOMAS.

SINCE I wrote my paper on the small Paraguayan opossum (*Marmosa marmota*, or, as it was then termed, *Micoureus griseus*) * the British Museum has received, firstly, a further consignment of the same interesting animal from Mr. R. Perrens; secondly, a valuable series of the true *M. elegans* from Valparaiso, collected and presented by Mr. J. A. Wolffsohn; thirdly, some specimens of the same group from Tucuman (coll. L. Dinelli); and, lastly, a number of specimens from Peru and Bolivia collected by the late Mr. Perry O. Simons. These specimens, amounting to about fifty in number, enable me more exactly to trace the characters and distribution of the two forms.

In 1894 I stated that *M. marmota* differed from *M. elegans* cranially by its more sharply edged supraorbital region, but that externally "the two species were widely different."

The further material induces me to modify this statement, for fresh specimens show that the two are closely similar externally, and were it not that well-defined supraorbital processes are present in *M. marmota* and entirely absent in the oldest *M. elegans*, I should look upon the Paraguayan species as but another local subspecies of the widely-spread Andean form. It may, however, be just distinguished from the most white-bellied of the races of *M. elegans* by the fact that the under surface, pure white throughout, is sharply defined laterally from the grey colour of the sides, none of the lower hairs having any slaty at all at their bases.

The recognition of *M. marmota* and *M. elegans* as species, and the different races of the latter as subspecies, is in agreement with their geography, for while all the known localities of *M. elegans*, far apart as they are, are connected with each other by mountainous country, *M. marmota*, in Paraguay, is separated from all the rest by the wide flat expanse of the Chaco.

---

* Ann. & Mag. Nat. Hist. (6) xiv. p. 184 (1894).

The different races of *M. elegans*, from Peru to Southern Chili, are all fairly uniform in size (head and body 80–100 millim.; tail 95–120; hind foot 14–16), though some of the largest specimens of typical *elegans* may attain as much as 137–139 millim., with tails of about the same length. The diagnostic tooth-measurement in opossums, the combined length of the first three molariform teeth, ranges from 4·6 to 5·0 millim. All the forms have a darker dorsal area, extending forward to a point between the eyes, a paler lateral band separating the dorsal area from the belly, and interrupted by darker patches on the shoulders and hips, and whitish or pale yellowish bellies more or less mixed, according to the subspecies, with slaty grey.

The following are the races I should be disposed to recognize, with their distribution and diagnostic characters; but it should be remembered that the colour-differences, though instantly recognizable by eye, are by no means easy to describe.

1. *Marmosa elegans venusta*, subsp. n.

Dorsal area rich and fairly dark, most approaching Ridgway's "wood-brown." Light lateral areas well defined. Median frontal line generally distinct. Under surface pale yellowish white, mostly mixed with slaty grey, the hairs on the chin, throat, centre of chest, and occasionally of belly above white to their roots.

Hab. Peru and Northern Bolivia; Surco, near Lima (*Simons*); Cochabamba, Paratani, and Sucre, Bolivia (*Simons*).

The Sucre specimens, by their rather paler tone, lead towards

2. *Marmosa elegans pallidior*, subsp. n.

General colour pale, approximately "drab-grey," less contrasted with the lighter lateral areas. Under surface nearly wholly white, the hairs bordering the colour of the flanks alone inconspicuously slate-based.

Hab. Challapata, Bolivia. A desert-form, probably characteristic of the arid country round and northwards of Lake Poopo.

3. *Marmosa elegans cinderella*, subsp. n.

Dorsal area darkest of group, nearest to Ridgway's "broccoli-brown"; lateral areas also dark; hips and sides of rump prominently dark cinereous grey ("slate-grey"). Under surface soiled yellowish, all the hairs except those on the chin broadly slaty basally.

Hab. Tucuman (*Dinelli*).

4. *Marmosa elegans* (typical).

Rather larger than the other subspecies and more variable in general colour. Dorsal area "drab" or greyer. Under surface white to the roots of the hairs along the middle line, nearly or quite to the anus; sides of belly grey mixed.

Hab. Chili; Valparaiso (*Darwin*, *Wolffsohn*).

Further south still, in Valdivia, occur the forms described * as *Didelphys australis*, F. Philippi, and *D. soricina*, R. A. Philippi, but I have not as yet seen specimens of either.

Detailed Descriptions of the new Forms.

Marmosa elegans venusta.

Size rather less than in typical *M. elegans*. Fur very soft and fine, about 10 millim. long on the back. General colour of dark dorsal area soft fawn-grey, perhaps most nearly approaching Ridgway's "wood-brown." Forehead darker, in continuation with a narrow median frontal line. Eye-rings black. Cheeks below eye prominently white, as are the lips and chin. Light lateral bands generally well defined, pale fawn. Under surface almost uniformly soiled yellowish white, the hairs white to their bases only on the chin and middle line of the throat and chest, slaty at base everywhere else, the slate showing through. Ears large and leafy, practically naked. Hands and feet pure white; outer side of arms like body, inner side like belly; hinder side of legs rather greyer than the rump, but not contrasting markedly with it. Tail uniformly thinly haired, pale brown above, white on the sides and below.

Skull as in typical *elegans*; no trace of supraorbital ridges or processes; the nasals not expanded posteriorly.

Dimensions of the type (measured in the flesh):—

Head and body 105 millim.; tail 118; hind foot, s. u. 15, c. u. 16; ear 23.

Skull: basal length 27·5; zygomatic breadth 17; nasals 12·7 × 2·2; combined length of three anterior molariform teeth 4·8.

Hab. Paratani, W. of Cochabamba, Bolivia. Altitude 2800 m.

---

* Arch. f. Nat. 1894, pp. 33 & 36. pl. iv.

Type. Female. B.M. no. 2. 1. 1. 120. Original number 1399. Collected by Mr. Perry O. Simons. Three specimens examined from the type locality, besides examples from the other places mentioned above.

Marmosa elegans pallidior.

General characters much as in *M. e. venusta*, but the coloration more pallid throughout. Dark dorsal area pale "drab-grey," the lighter lateral areas contrasting but little with it. Under surface practically wholly snow-white, but not so sharply defined laterally as in *M. marmota*, as the grey bases to the lateral hairs encroach a little on each side on to what are, properly speaking, belly-hairs. Rump and backs of hind limbs pale drab like the body; hands and feet snowy white. Tail pale grey above, white laterally and below.

Skull as in *M. e. venusta.*

Dimensions of the type (measured in the flesh):—

Head and body 95 millim.; tail 107; hind foot (s. u.) 14; ear 24.

Skull: basal length 25; length of three anterior molariform teeth 4·7.

An older specimen measures:—Head and body 104; tail 119; hind foot (s. u.) 15; ear 24·5.

Hab. Challapata, east of Lake Poopo, Bolivia. Altitude 3800 m.

Type. Male. B.M. no. 2. 2. 2. 116. Original number 1650. Collected 26th October, 1901, by P. O. Simons. Six specimens.

Marmosa elegans cinderella.

Size as usual; tail apparently rather longer in proportion. General colour decidedly darker than in the other forms, approximating to Ridgway's "broccoli-brown"; light lateral bands dull fawn, not strongly contrasting with the back. Forehead darker, continuous with a comparatively broad but ill-defined median frontal line. Under surface pale yellowish, the bases of the hairs everywhere broadly slaty, except just on the chin. Sides of rump and back of hips dark cinereous grey, sometimes contrasting markedly with the body. Hands and feet dull whitish. Tail dark brown above, white laterally and below.

Skull as usual, except that as compared to true *M. elegans* there is a more marked sharpening of the supraorbital edges, thus showing a certain inclination towards *M. marmota.*

Dimensions of the type (measured in the flesh):—

Head and body 109 millim.; tail 132; hind foot (s. u.) 16; ear 24.

Skull: basal length 27; zygomatic breadth 16·6; length of three anterior molariform teeth 4·9.

Hab. Tucuman. Altitude 450 m.

Type. Female. B.M. no. 0. 7. 9. 20. Original number 151. Collected 1st December, 1899, by L. Dinelli. Three specimens examined.

XXIII.—*The Genet of the Balearic Islands.*

By Oldfield Thomas.

During the collecting-trip to the Balearic Islands in 1900, of which the mammal results were described before the Zoological Society in the following year *, we were unable to obtain any examples of the Genet, an animal by no means uncommon in Majorca, but not occurring in Minorca.

Since then, however, by the kind help of Don Miguel Riutort, of Inca, we have been able to obtain a series of excellently prepared skins of this animal, and a careful comparison with a series of the Common Genet from Seville convinces me that the Majorcan race should have a special name. Some of the variations of the mainland form, however, show sufficient approximation to the Balearic one to make it advisable only to give subspecific rank to the latter.

Genetta genetta balearica, subsp. n.

Size averaging slightly larger than in the Seville Genet. General colour quite uniform in all the specimens, much clearer grey than in the allied form, without the fulvous or buffy suffusion generally present in that animal. Consequent on this difference the dark spots and other markings stand out much more distinctly, the deep black spots contrasting sharply with the clear whitish grey of the ground-colour. Body-markings approximately similar in number and position to those in *G. genetta*, but the nuchal lines break up sooner into spots, and the spots on the back and flanks are nearly always rounded or quadrangular in shape, instead of being frequently linear. Under surface, limbs, and tail as in *G. genetta*, except that the characteristic small black spots on the forearms and wrists are either fewer or absent.

* P. Z. S. 1901, p. 35.

Skull quite as in *G. genetta.*

Dimensions of the type (measured in the flesh by Don Miguel Riutort):—

Head and body 520 millim.; tail 480; hind foot 88.

Skull: basal length 87; zygomatic breadth 45.

Hab. Majorca, Balearic Islands. Type from Inca, altitude 50 m.; other examples from Alcudia and Mancor.

Type. Male. B.M. no. 1. 6. 1. 3. Collected 15th April, 1901, by Don Miguel Riutort.

XXIV.—*On Two new Mammals from China.*

By OLDFIELD THOMAS, F.R.S.

IN a further consignment of Chinese mammals, presented by Mr. F. W. Styan, with his customary liberality and patriotism, to the National Museum, there are examples of the following new bat and new water-shrew, the former needing distinction as a new genus:—

IA, gen. nov. (*Vespertilionidæ*).

General characters of *Vespertilio*, but dental formula as in *Pipistrellus.* Size very large. Hind claws disproportionally long.

Outer upper incisor minute; inner long, thick, bicuspid terminally. Small upper premolar exceedingly minute. Molars comparatively simple, the minute outer supplementary cusps scarcely developed, and the large inner cusp without a smaller cusp on its hinder base. Lower incisors trifid, overlapping. Lower premolars not markedly crushed, the anterior about half the height of the posterior. Lower molars with the middle one of the three inner cusps markedly higher than the other two; last molar with its posterior talon small, about half the area in section of the main portion. These tooth-characters are all approximately as in the Serotine group and different from what is found in *Pipistrellus.*

Skull short and powerful, not flattened; with a large crested and overhanging occipital "helmet," exceeding that of the Serotine.

Proportions of ears, tragus, and digits about as in the Serotine, but the hind claws disproportionally long. No postcalcareal lobule.

Ia io, sp. n.

Size very large, the largest member of the family Vespertilionidæ, the forearm slightly exceeding that of *Pterygistes lasiopterus*, the largest previously known species. General appearance suggesting that of a gigantic dark-coloured Serotine. Fur very soft and fine, hairs of back about 10 millim. in length. General colour above dark blackish brown, the hairs dark brown throughout or with indistinct lighter tips; below, the hairs are similarly brown basally, but broadly lighter terminally. Rump rather, but not conspicuously, browner than the more blackish shoulders. Muzzle black, with numerous black whisker-bristles. Ears fairly large, their inner margin strongly and evenly convex from the distinct basal lobule to their tip; tip narrowly rounded off; outer margin straight or faintly concave above, slightly convex below; antitragus long, low, rounded. Tragus of medium length, its inner margin concave, tip narrowly rounded, outer margin strongly convex, slanting strongly forwards above and below from a point opposite the middle of the inner margin (in this respect not unlike pl. xvi. fig. 4 of Dobson's Catalogue); basal lobule large, directed downwards.

Limbs and wing-membranes practically naked throughout; the body-fur extends slightly on to the extreme base of the interfemoral membrane above, and there are a few fine hairs along the back of the calcar. No postcalcareal lobule. Calcar very short. Feet large, the claws enormous, strongly curved. The length of the longest claw (measured above) in *Pipistrellus* and *Vespertilio* is about one twentieth of the forearm length, in *Ia* it is about one fourteenth. Wings attached to the sides of the ankles. Tail-tip free of the membrane for about 5 millim.

Skull rather elongate, not markedly flattened; the zygomata not widely expanded. Occipital "helmet" high and projecting backwards over the occipital surface. Anterior palatine notch extending back to the level of the small premolars. Bullæ of average size.

Outer upper incisors quite minute, blunt and rounded, not as high as the cingulum of i^1 and not more than about one twelfth of its area in cross-section, situated on the outer anterior side of it in such a way as to be conspicuously visible from above, even when the skull is tilted so far forward that the large inner incisor cannot be seen. Inner incisors long, powerful, slightly convergent, bicuspid terminally, the small outer secondary cusp less developed than in the Serotine. Small upper premolar very minute, even smaller than i^2, which it resembles in shape, situated quite internal to the closely approximated canine and large premolar, quite invisible externally. Other teeth as described above.

Dimensions of the type (measured in skin):—

Forearm 72 millim.

Head and body 104; tail 63; ear (wet) 24, tragus on inner edge 6·5; thumb (c. u.) 14; index-finger, with its rudimentary metacarpal, 73; third finger, metacarpal 70, first phalanx 24·3, second phalanx 20; fifth finger, metacarpal 61, first phalanx 12·7, second phalanx 7; tibia (c.) 29; tibia and foot together, s. u. 44, c. u. 46·5; calcar (c.) 11.

Skull: greatest length 27; zygomatic breadth 17; depth of nasal notch 5·3; interorbital breadth 9·7; intertemporal breadth 5·1; breadth of brain-case 12·1; front of canine to back of m^3 10·9, same measurement below 11·6.

Hab. Chung Yang, S. Hupeh, China.

Type. Male. B.M. no. 2. 6. 10. 2. Killed 13th January, 1902. Presented by F. W. Styan, Esq.

The proper treatment of this most interesting bat is a difficult problem, and other naturalists may think it might have been assigned to one of the previously known genera. But it appears to me that genetically it is a gigantic Serotine, and if this be the case to put it in *Pipistrellus* would be absurd, while to put it with the Serotine in *Vespertilio* would be to ignore the convenience, now generally recognized, of considering the presence or absence of the anterior upper premolar as by itself of generic importance.

To the Serotine it is related by its general form, the proportions of its ears and tragus, and the structure of its incisors and molars; and its retention of the little premolar above is the only point in which it agrees with the Pipistrelle. Its large, strongly curved claws are peculiar to itself.

Mr. Styan is to be congratulated on this interesting addition to the many Chinese mammals in whose discovery he has been instrumental.

Chimarrogale leander, sp. n.

Size small, only exceeding the little *C. Styani*, de Wint., of Sze-chuen, and markedly less than in *C. himalaica*, Gray. General colour a rather paler, more slaty, and less blackish grey than in *C. himalaica*; but, as in all the members of this genus, the difference is trifling. Under surface uniformly slaty grey, scarcely paler than the upper surface. Upper surface of hands and feet dull brownish grey, the darker metapodial markings present, but less defined than usual. Tail well-haired, brown above and at the end all round, sharply defined white below for its proximal two thirds.

Skull and teeth apparently quite of the usual proportions, the different species seeming to differ from each other only in size.

Dimensions of the type (measured in skin):—

Head and body (stretched) 120 millim.; tail 92; hind foot (s. u.) (wet) 23·2.

Skull: greatest length 24; basal length 22; interorbital breadth 5·7; length of upper tooth-row 11·2; combined length of p^4 and three molars 6·5; lower tooth-row from tip of incisors 10·4.

Hab. Kuatun, N.W. Fokien. Altitude 1200 m.

Type. B.M. no. 2. 6. 10. 3. Presented by F. W. Styan, Esq. "Winter."

This species is most nearly allied to the Himalayan *C. himalaica*, but differs by its smaller size, smaller teeth, paler general colour, darker belly, and the non-extension of the white of the underside of the tail to the end. The Japanese *C. platycephala* is much larger, the beautiful Sze-chuen *C. Styani* is smaller, with a strongly contrasted light underside, and the Bornean *C. phæura* is darker throughout, with a wholly brown tail. Although undoubtedly all very closely allied to each other, the different species seem to be readily separable by these characters of size and colour.

XXV.—*A new Vole from the Lower Yang-tse-kiang.* By Oldfield Thomas.

THE only Vole hitherto known from the Oriental part of China has been the peculiar *Microtus* (*Eothenomys*) *melanogaster*, M.-Edw., found in the mountains of N.W. Fokien, and it has therefore been with much interest that I have examined a series of a species found by Mr. E. B. Howell near Nanking, on the Lower Yang-tse-kiang, the river usually considered as the dividing-line between Palæarctic and Oriental China.

The species proves to be of considerable interest from its combination of characters, as will be seen below.

Acting on the suggestion of Mr. Howell, I propose to call it

Microtus calamorum, sp. n.

Size comparatively large (hind foot attaining 23 millim., s. u.). General colour above dark brown, of about the same intensity as in European *M. agrestis*, but more heavily lined. Sides of nose, rump, and hips with a slight fulvous suffusion. Under surface whitish, the bases of the hairs slaty. Ears fairly long, not entirely hidden by the fur, dark brown. Hands pale greyish, feet dull brown above. Tail more than twice the length of the hind foot, blackish brown above, white below.

Lateral glands apparently present. Mammæ 2—2=8. Sole-pads only 5; hinder part of sole hairy. Claws of hind feet longest.

Skull large and powerful, rounded above, unusually high, cylindrical, and unflattened; the height from the molar surface to the vertex nearly equal to the breadth of the brain-case. Ridges and angles of brain-case but little marked. Interparietal of medium size, its hinder edge straight, directly transverse, its anterior also but little bowed, except for the median projecting point. Anterior edge of zygoma-root concave. Palatal foramina contracted behind. Pits on each side of hinder palate deep and well defined, the opening of the posterior nares narrow, sharply V-shaped. Bullæ of medium size.

Incisors strongly thrown forward, visible from above. Molar pattern essentially as in *M. arvalis*, but m_1 more simple. M^1 with the usual five spaces and without any posterior extra projection, m^2 with four and m^3 with four spaces and a posterior *c*, all these teeth being exactly as figured by Blasius* in *M. arvalis*. M_1 with six spaces and a simple anterior triangle, as figured by Blasius (p. 359) in *M. nivalis*, but the outer anterior angle rounded and the antero-internal edge slightly hollowed, so as to produce an indistinct extra angle.

Dimensions of the type (measured in the flesh):—

Head and body 127 millim.; tail 53; hind foot (s. u.) 21; ear 14. In a larger specimen these measurements are respectively 139, 53, 23, and 14.

Skull: basilar length 26·1; greatest breadth 17; breadth of brain-case above zygomata 12·7; height of crown from molar level 12·1; palate length 15·5; length of palatal foramina 5·3; length of upper molar series 7·5.

---

* Säug. Deutschl. p. 370.

Hab. Lower Yangtse, near Nanking. Sea-level. (Type taken on the north bank.)

Type. Female. B.M. no. 2. 6. 21. 5. Original number 10. Collected 28th February, 1902, by E. B. Howell.

From the number of mammæ and sole-pads, the projecting incisors, and other characters it appears to me that *M. calamorum* is most nearly allied to the American species placed by Miller with the Old-World water-voles in the subgenus *Arvicola.* Indeed, its tooth-pattern is by no means unlike that of *M.* (*Arvicola*) *macropus,* as figured by him in his important work on the subfamily [*]. The habits of the animal are in agreement with this view of its affinities.

Perhaps I should myself have been disposed to recognize this "*Aulacomys*" group as subgenerically distinct from true *Arvicola,* but have not worked at the subject sufficiently to express a definite opinion.

Mr. Howell sends me the following account of the habits of *M. calamorum*:—

"This vole is found on both banks of the Yangtze River, and is particularly common around Nanking. It is never found far from water—not that it is aquatic in its habits, but on account of its apparent inseparability from the peaty soil, originally the alluvial deposit of the river, and the reeds which grow there in such profusion.

"These reeds, which in summer attain a height of from 12 to 15 feet, are all cut down in winter. The ground below is dotted with patches of coarse grass, and it is below this grass that the voles for the most part make their burrow. The animals are gregarious in their habits, sometimes covering an area of 15 yards square with their holes.

"Their food, from an examination of their stomachs and also of their droppings, consists of the usual roots, grasses, &c., and also of the pith of the reeds, of which they must destroy a large quantity. The female produces five or six at a birth.

"The adult attains a considerable size, one caught by me being 139 millim. from snout to root of tail.

"Individual varieties are not unknown, as several in my possession show signs of a white patch between the ears (*e. g.*, no. 22). In several, in fact in nearly all *large* specimens trapped by me during the months of February and March, 1902, the long brown hair on the rump and between the scapulars is abraded, leaving only the dark grey fur below.

---

[*] N. Am. Fauna, no. 12, p. 67 (1896).

"This vole occurs also at Chinkiang (according to Mr. de La Touche), where, during the floods of the summer of 1901, it was flooded out of its burrows and invaded the settlement.

"In the event of the vole proving a new species, which, from what Messrs. Styan and La Touche tell me, seems not impossible, might I suggest that some specific name be given to it which would imply its apparent inseparability from the reeds among which it is invariably found?"

XXVI.—*Diagnosis of a new Central-American Porcupine.*

By OLDFIELD THOMAS.

Coendou Rothschildi, sp. n.

A spinous short-haired species related to the *C. quichua*, Thos., of Ecuador, and widely different from the long-haired Central-American *C. mexicanus*. Distinguished from *C. quichua* by being profusely speckled with white, the spines of the back all white-tipped. Skull rather larger than in that animal, more inflated above the orbits, and with a larger nasal opening (breadth 17 millim.). Anterior cheek-tooth (p^4) scarcely or not larger than the molars.

Dimensions of the type:—

Head and body 410 millim.; tail 330; hind foot, s. u. 60, c. u. 68.

Skull: basilar length 71; length of upper cheek-tooth series 17·3.

Hab. Sevilla Island, off Chiriqui, Panama. Coll. J. H. Batty.

This interesting porcupine, of which further details will be given later, represents the *C. bicolor-quichua* group, hitherto not recorded north of Ecuador. It has no near relationship to the thickly furry *C. mexicanus*, the only species hitherto recorded from Central America.

BIBLIOGRAPHICAL NOTICE.

Palæontologia Indica. Series IX. Vol. II. Part 2. *The Jurassic Corals of Cutch.* By J. W. Gregory, D.Sc., F.G.S. 196 pages and Index, pages i–ix; 26 plates (ii.*a*–xxvii.). Folio. Calcutta: Geol. Surv. Office. London: Kegan Paul & Co. 1900.

The fossil corals here described by Dr. J. W. Gregory, F.G.S., late of the British Museum (Nat. Hist), now F.R.S., and Professor of Geology in the University of Melbourne, Australia, were collected by Wynne and Fedden in 1867–69, and by Stoliczka in 1872. Among the 8000 specimens dealt with there is an extreme variability, few of them being exact counterparts one of another. The critical examination, here given in detail, has resulted in the unavoidable creation of about 3000 new species and noticeable varieties. The Jurassic series in Cutch, and the distribution of the corals there in the several groups and zones or horizons, are noted at pages 2–4. The previous geological notices by C. W. Grant, W. T. Blanford, A. B. Wynne, F. Stoliczka, and W. Waagen are duly recorded; and the summaries in chapter xi. of the 'Manual of Geology of India,' part i. 1879, and chapter ix. of the second edition, 1893-94, are referred to.

The geological groups of Cutch have been previously classified as follows:—

Umia group	....	Tithonian.
Katrol group	Upper part....	Kimeridgian.
	Lower part....	Oxfordian.
Chari group	Upper part....	Oxfordian.
	Lower part....	Callovian.
Putchum group	....	Bathonian.

Most of the corals come from the Upper Putchum beds, from a place N.W. of Jumara, and several from the Chari beds; but the corals give no definite evidence of the successional or stratigraphical value of these two groups. The systematic synopsis (at pages 31–33) indicates the recognized horizons of the several European species most closely resembling (not necessarily closely allied to) these Cutch corals, and shows that there may be 71 having such European representatives; of these, 66 are supplied by the Putchum beds, as follows, showing a confusion of specific relationships among the more assorted formations:—Upper Cretaceous 3; Neocomian 8; Portlandian 4; Kimeridgian 12; Corallian 16; Callovian 4; Bathonian 15; Bajocian 4; Triassic 1. "This apparent 'confusion of species' belonging to different horizons is usually observed when distant coral-faunas are compared." The Cutch "corals show that the beds are approximately equivalent or homotaxial to the European Upper Bathonian or Callovian, but they were deposited in different zoological provinces, and corals then lived in the Indian seas which are not found in Europe until later; similarly some European families, such as the Amphiastræidæ, which are not represented in the Putchum limestones, appear to have entered the Indian region, and become abundant there, during the subsequent Chari period. . . . Among the European Bathonian and Callovian faunas the Cutch corals most closely resemble those of the Crimea and of Galicia described by Eichwald, Solomko, and von Reuss. The most striking feature of the Cutch corals is the prevalence of small patelliform corals and of rounded nodular coralla in the massive forms; there is a marked absence of corals with the arborescent growth so common in the European Jurassic species. Even genera in which the coralla are typically cæspitose, such as *Goniocora* and *Latomæandra* (sensu stricto), are represented in Cutch by low nodular coralla. Encrusting corals are very scarce. We may infer, from the predominant nodular form of the coralla, that the corals grew on a loose sea-floor exposed to such strong currents that arborescent and lamellar growth was impossible.

"Hence, in spite of the great local abundance of corals in the Upper Putchum beds, to the north-west of Jumara, it does not appear correct to speak of the deposit as a coral-reef. A reef is a line of rocks that reaches or nearly reaches to the surface of the sea. The Jumara corals cannot have formed coral-rocks, and we may infer, from the rarity of rolled beach-worn specimens, that the corals lived below the depth of surf-action. The Jumara deposit may therefore be better described as a coral-bank than as a coral-reef" (page 4).

The nomenclature of the coral skeleton is carefully explained, and an interesting account of the several classifications and revisions of the Madreporarian corals is given, together with a necessary consideration of the taxonic value of the skeletal structure. A very useful bibliographic list is also given (pp. 23–27).

The preliminary studies above suggested lead to a possible critical determination of "Coral Species" (pp. 17–22). (1) There may be mutations, changes, or variations in structure and form more or less differentiated by peculiarities in the growth of the individual, either hereditary or unique. (2) Extreme variability of form among the Invertebrata and the common sorts of plants may be owing to conditions of growth ruled by circumstances of environment, and it is possible for two closely agreeing forms to be merely homoplastic, but having no definite affinity.

Thus certain corals may have "probably descended from different types and have independently acquired the same specific form. To give them the same specific name would therefore be misleading, as it would imply a relationship that does not exist.

"If we admit the possibility of the independent acquirement of the same specific characters, it is clearly misleading to correlate deposits by the presence of such 'species,' for the group of corals included in a 'species' may be quite an artificial assemblage.

Hence in the case of such animals as corals we must recognize some other character besides form in the specific diagnosis. We cannot hope to make 'species' true phylogenetic species unless geographical distribution, and possibly geological distribution, be also taken into account. Huxley suggested in 1880 that it would some day be necessary 'to give up the attempt to define species, and to content oneself with recording the varieties . . . . which accompany a definable type in the geographical district in which the latter is indigenous.' It is with the meaning which Professor Huxley predicted would some day be given to the term 'species' that it is used in this monograph. I sometimes regret that in the description of this coral-fauna I did not abandon the binomial Linnean nomenclature altogether, and simply figure and describe the principal variations represented in the collection" (page 20).

"The adoption not only of a trinomial, but sometimes of a polynomial system, is the inevitable result of the retention of a system of nomenclature based on a belief in the fixity of species. That system is impracticable among corals unless we have the courage and patience to make the species nearly as numerous as the specimens. Thus, as Dr. Hinde has pointed out, one logical author has recently founded 86 new species belonging to a single genus, and 63 per cent. of the new species are represented only by single specimens. An alternative course is to change the system of nomenclature, so that groups of individuals or circuli may be described instead of single specimens or fictitious 'species'" (page 21).

Three supplementary plates (comprising twenty diagrams) illustrate the specific and varietal characters in several groups:—

Plate A, Figs. 5–9 show the relationship of some Indian to some European sets of types and varieties, composing "circuli," opposite page 96; Table no. 3, p. 97.

Plate B, Figs. 10–14, ditto. Opposite page 105. Tables V. and VI.: pages 104 and 105.

Plate C, Figs. 15-20, ditto. Opposite page 110 or 113. Tables VIII. and IX.; pages 110 and 113.

A systematic synopsis and a full list of the Cutch fossil corals (pp. 28–33) indicate the types and their varieties. In the list a *circulus*—that is, a type and its varietal group—is specially noted as *Montlivaltia cornutiformis* (nos. 17–23 and p. 85) and another as *Comoseris jumarensis* (nos. 43, 44, and p. 157).

Not only is Dr. J. W. Gregory preeminent in his knowledge of recent and fossil Invertebrata, but he is exceptionally correct, orthographically and grammatically, in his use of words derived from the dead languages. Only two specific names (at pages 157 and 169) have inadvertently false concord. The rehabilitation of the diphthong in *Astræa*, *Mæandrina*, &c., will, we hope, lead others in the right way. A good Index, partly "morphological &c." and partly "systematic" (pp. i–ix), completes this elaborate monograph,* so useful to both special and general geologists.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 57. SEPTEMBER 1902.

XXVII.—*Rhynchotal Notes.*—XIV. Heteroptera: *Families* Hydrometridæ, Henicocephalidæ, *and* Reduviidæ (*part.*).

By W. L. Distant.

My last contribution terminated with the family Aradidæ. In the sequence of the Catalogue by Lethierry and Severin two small families—Hebridæ and Hydrometridæ—follow the Aradidæ; but in these Walker proposed neither new genera nor species, and therefore, with the exception of the Hydrometridæ, no mention is made of them in the following pages. The examination of the Reduviidæ is made to the end of the Acanthaspinæ; but species differently located by Walker will probably be subsequently found which will require inclusion in that subfamily, while a few other species stand over for further examination and comparison.

Fam. Hydrometridæ.

Hydrometrinæ.

Genus Hydrometra.

Hydrometra albolineata.

Limnobates albolineatus, Scott, Ann. & Mag. Nat. Hist. (4) xiv. p. 447 (1874).
Hydrometra Greeni, Kirk. Entomol. 1898, p. 2.

Hab. Japan, Bombay, Ceylon.

Mr. Kirkaldy, in the unique female specimen he described, appears to have dealt with a rubbed specimen. I have a series of Ceylonese examples which perfectly agree with Scott's type (in the Brit. Mus.) and description.

Hydrometra strigosa.

Limnobates strigosa, Skuse, Record Austr. Mus. ii p. 43, pl. xi. figs. 1, 2 (1893).

Closely allied to the preceding species. The British Museum possesses a specimen from Adelaide.

Fam. **Henicocephalidæ.**

Genus HENICOCEPHALUS.

Enicocephalus, Westw. Trans. Ent. Soc. 1837, p. 22.
Stenopirates, Walk. Cat. Het. vii. p. 139 (1873).

Henicocephalus collaris.

Stenopirates collaris, Walk. Cat. Het. vii. p. 139. n. 1 (1873).

Henicocephalus anthocoroides.

Stenopirates anthocoroides, Walk. Cat. Het. vii. p. 139. n. 1 (1873).

Long. 4½ millim.

Smaller than the dimensions given (7–5 millim.) for the other West-African species, *H. curculio*, Karsch, which has been placed, probably in error, as a synonym of the Indian species, *H. basalis*, Westw., by Lethierry and Severin. I have not, however, seen Karsch's species.

Henicocephalus Wallacei, sp. n.

Piceous; postocular portion of head brownish piceous; lateral margins of the hemelytra, from which a short curved line is emitted a little beyond centre, coxæ, bases of intermediate and posterior femora, the intermediate and posterior tibiæ, the tarsi, and third and fourth joints of the antennæ ochraceous. Antennæ finely pilose, second and third joints subequal in length; head robust, broad, the anteocular a little longer than the postocular area, somewhat strongly pilose; anterior lobe of pronotum a little longer than posterior lobe; hemelytra not quite reaching apex of abdomen. (*Two carded specimens.*)

Long. 7 millim.

Hab. New Guinea; Dorey (*Wallace*, Brit. Mus.).

Henicocephalus majusculus, sp. n.

Head, pronotum, and sternum dull reddish ochraceous; hemelytra piceous; base and lateral margins of hemelytra, legs, and abdomen stramineous; abdomen with the lateral areas mottled with brownish; antennæ pale fuscous brown, basal and apical joints paler in hue. Antennæ finely pilose, second joint slightly longer than the third; anterior lobe of pronotum behind the pronotal collar moderately sculptured and centrally discally sulcate; legs somewhat strongly pilose; eyes black. ♀.

Long. 11 millim.

Hab. Ceylon (*Green*, Brit. Mus.).

Fam. Reduviidæ.

SAICINÆ.

Genus SAICA.

Saica ochracea, sp. n.

Body above and beneath uniformly dull ochraceous; antennæ, lateral spines to pronotum, scutellar spine, and legs piceous; coxæ and trochanters ochraceous; pronotal spines long, obliquely straight, directed a little forward and upward; scutellar spine long, slightly curved, directed upward and hindward; posterior femora long, about reaching apex of abdomen; antennæ and legs finely hirsute, the anterior femora clothed beneath with fine setæ.

Long. 14 millim.; exp. pronotal spines 4 millim.

Hab. Ecuador: Paramba (*Rosenberg*, Brit. Mus.).

TRIBELOCEPHALINÆ.

Genus TRIBELOCEPHALA.

Tribelocephala indica.

Opistoplatys indicus, Walk. Cat. Het. viii. p. 20. n. 2 (1873).

This species occurs in both India and Ceylon. *T. lignea*, Reuter (Rev. d'Entom. vi. p. 166, 1887), from Java, may probably prove to be conspecific.

Tribelocephala pallescens, sp. n.

Head, antennæ, lateral marginal area of corium, and body beneath brownish ochraceous, palely hirsute; hemelytra ochraceous, with a minute white spot near end of clavus and two very small, contiguous, transverse, linear white spots near apex of corium; first joint of antennæ subequal to or slightly shorter than head; pronotum with a distinct central carinate line on the posterior lobe.

Long. 13 millim.

Hab. Borneo: Sandakan (*Creagh*, Brit. Mus.); Flores (Brit. Mus.).

Allied to *T. indica*, Walk., but differing by its much more hirsute character, especially on the lateral marginal area of the corium.

Tribelocephala Boschjesmana.

Tribelocephala Boschjesmana, Stål, Œfv. Vet.-Ak. Forh. 1855, p. 45.
Opinus acuticeps, Walk. Cat. Het. viii. p. 2. n. 4 (1873).

Genus OPISTOPLATYS.

Opistoplatys foveatus, sp. n.

Head, antennæ, anterior lobe of pronotum, scutellum, body beneath, and legs fuscous; eyes, posterior lobe of pronotum, corium, tarsi, and apical joints of antennæ dull ochraceous; membrane black; corium elongately foveate at inner basal area and more elongately foveate on the discal area; basal joint of antennæ a little longer than head, first and second joints subequal in length; head, pronotum, scutellum, and legs coarsely pilose; antennæ with the first and second joints strongly hirsute.

Long. 9 millim.

Hab. New Guinea: Dory (Brit. Mus.).

Opistoplatys australasiæ.

Opistoplatys australasiæ, Westw. Zool. Journ. (5) xx. p. 447, pl. xxii. fig. 9 (1859).
Reduvius funereus, Walk. Cat. Het. vii. p. 203. n. 68 (1873).

STENOPODINÆ.

Pygolampis æthiops, sp. n.

Dark shining piceous brown, head piceous; legs luteous, apical areas of the femora, bases, apices, and a central annulation to anterior and intermediate tibiæ, base and apex of posterior tibiæ, and inner area of anterior femora (enclosing some small ochraceous spots) black; antennæ with the basal joint brownish, with obscure ochraceous annulations, distinctly longer than the head, subequal in length to the pronotum, remaining joints fuscous; pronotum with a distinct central impression with some ill-defined carinæ on each side;

body beneath brownish ochraceous, central disk of sternum and abdomen more or less piceous.

Long. ♀ 18 millim.

Hab. Natal: Isipingo (*G. A. K. Marshall*).

Pygolampis nyasæ, sp. n.

Closely allied to the preceding species, but with the pronotum much more distinctly carinate, the carinæ consisting of two central and continuous, on each side of which are two convexly united about middle and continued to apex by two narrow conterminous carinæ; legs pale luteous, apices of femora brownish; other characters as in *P. æthiops*.

Long. ♀ 14 millim.

Hab. Nyasaland: Fort Johnson (*Rendall*).

Genus SASTRAPADA.

Sastrapada Baerensprungi.

Harpagochares Baerensprungi, Stål, Œfv. Vet.-Ak. Forh. 1859, p. 381.
Sastrapada bipunctata, Walk. Cat. Het. viii. p. 28. n. 7 (1873).
Pygolampis innotata, Walk. *loc. cit.* p. 36. n. 17.

Genus CTENOTRACHELUS.

Ctenotrachelus longicollis.

Sastrapada longicollis, Walk. Cat. Het. viii. p. 28. n 4 (1873).
Ctenotrachelus longicollis, Champ. Biol. Centr.-Am., Rhynch. ii. p. 185 (1898), note.

Head beneath, sternum, and abdomen with a continuous fuscous fascia on each lateral area; meso- and metasterna and abdomen with three slender faint and broken discal fuscous lines.

Long. 19 millim.

Hab. Amazons (Brit. Mus.).

Genus NITORNUS.

Nitornus fuliginosus, sp. n.

Above ochraceous, mottled with fuscous; beneath with legs more uniform ochraceous; head with the postocular a little darker than the anteocular area; eyes black; antennæ ochraceous, apex of second and the whole of third and fourth joints fuscous; ocelli distinct; pronotum with a broad, central, more or less distinct, longitudinal fuscous fascia, and the lateral areas obsoletely suffused with the same colour; scutellum with a central basal fuscous spot and with the apex tuberculately elevated; corium pale fuscous brown, lateral margins and subapical area luteous, a distinct brown spot near inner angle; membrane pale dull ochraceous, the marginal areas darker; connexivum ampliately produced from about centre and lobately angulate, transversely dull castaneous at the lobate angles; abdomen beneath with a distinct central ridge; rostrum luteous, lateral areas of first joint, apex of second, and the remaining joints dark brown; prosternum very distinctly longitudinally sulcate.

Long. 21 millim.

Brazil: Iguarassee (*G. Ramage*, Brit. Mus.).

Genus ONCOCEPHALUS.

Oncocephalus cingalensis.

Oncocephalus cingalensis, Walk. Cat Het. viii. p. 26. n. 16 (1873)

Pronotum with two transverse ochraceous spots at base.

Hab. Ceylon; Singapore; Borneo: Sandakan (Brit. Mus.).

Oncocephalus annulipes.

Oncocephalus annulipes, Stål, Œfv. Vet.-Ak. Forh. 1855, p. 41. 1; En. Hem. iv. p. 88 (1874).

Oncocephalus cingalensis, Kirby (nec Walk.), Journ. Linn. Soc., Zool. xxiv. p. 117 (1891).

Stål identified this species, which he described, from Caffraria, Sierra Leone, Philippines, Australia, and New Caledonia. The Brit. Museum also contains specimens from Ceylon, Singapore, Java, Borneo, and East Africa. I took the species in the Transvaal. Some recent writers—Reuter, Lethierry and Severin—have considered it as confined to South Africa; but this seems clearly erroneous.

Oncocephalus lineatus.

Reduvius lineatus, Walk. Cat. Het. vii. p. 200. n. 61 (1873).

Genus CANTHESANCUS.

Canthesancus geniculatus, sp. n.

Dull brownish ochraceous; head with a broad central fascia and another on each lateral area black, the central fascia attenuated at the area of the eyes and again at base, and more or less margined on each side with reddish ochraceous; antennæ black, third joint (excluding apex) ochraceous; pronotum with the lateral and posterior margins and a central and anteriorly attenuated fascia on posterior lobe black, all the black markings margined with reddish ochraceous, and the anterior and lateral spines of that colour; scutellum black, its spine ochraceous, with the apex fuscous; hemelytra much mottled with ochraceous and with a small spot at about one fourth from base, a larger subquadrate spot concavely sinuate posteriorly at base of membrane, and a central narrow oblique spot on outer area of membrane glossy black; body beneath fuscous; legs piceous, bases of femora and the tibiæ and tarsi ochraceous, the apices and a subbasal annulation to the anterior and intermediate tibiæ and more than the apical half of posterior tibiæ black; lateral spines to pronotum moderately directed backward, scutellar spine curved and strongly directed backward; first and second joints of antennæ subequal in length; femora very distinctly sulcated near apices.

Long. 26 millim.

Hab. China: Kiukiang (*Pratt*, Brit. Mus.).

Genus THODELMUS.

Thodelmus Falleni.

Thodelmus Falleni, Stål, Œfv. Vet.-Ak Forh 1859, p. 378.
Stenopoda hastata, Walk. Cat. Het. viii. p. 32. n. 14 (1873).

Genus —— ?

Stenopoda hyalinipennis, Walk. Cat. Het. viii. p. 31. n. 10 (1873).
Podormus hyalinipennis, Leth. & Sev. t. iii. p. 85 (1896).

The unique type of this species is without abdomen, and therefore exact generic identification is impossible. Lethierry and Severin have placed it in the genus *Podormus*; but this is incorrect, as the postocular portion of the head is as long or a little longer than the anteocular portion, not "parte anteoculari parte postoculari nonnihil longiore et graciliore," as described by Stål; the legs are longly pilose.

SALYAVATINÆ.

Genus LISARDA.

Lisarda inornata.

Acanthaspis inornata, Walk. Cat. Het. vii. p. 175. n. 51 (1873).

Lisarda rhypara.

Lisarda rhypara, Stål, Œfv. Vet.-Ak. Forh. 1859, p. 192.
Reduvius argillaceus, Walk. Cat. Het. vii. p. 195. n. 47 (1873).

Lisarda cœnosa.

Acanthaspis cœnosa, Stål, Œfv. Vet.-Ak. Forh. 1855, p. 39.
Reduvius turpis, Walk. Cat. Het. vii. p. 192. n. 41 (1873).

Walker's type is a somewhat faded specimen, but the black fasciæ to the abdomen beneath are quite distinct, though not mentioned in the description.

Lisarda annularis.

Reduvius annularis, Walk. Cat. Het. vii. p. 199. n. 60 (1873).

Lisarda conspersa.

Reduvius conspersus, Walk. Cat. Het. vii. p. 197. n. 52 (1873).

Genus VALENTIA.

Valentia apetala.

Petalochirus apetalus, Vuill. Ann. Soc. Ent. Fr. 1861, p. 142, pl. i. fig. 10.
Petalochirus funestus, Walk. Cat. Het. viii. p. 9 (1873).

Genus PETALOCHIRUS.

Petalochirus malayus.

Petalochirus malayus, Stål, Œfv. Vet.-Ak. Forh. 1859, p. 191; Reut. Rev. d'Entom. vi. p. 162 (1887).
Petalochirus vicinus, Sign. Ann. Soc. Ent. Fr. 1862, p. 126.
Petalochirus singularis, Walk. Cat. Het. viii. p. 10. n. 12 (1873).

The species identified by Walker as *P. malayus* (*loc. cit.* p. 9. n. 7) is *P. brachialus*, Stål. Mr. Kirby was thus misled into including the first-named species in his Ceylonese enumeration (Journ. Linn. Soc., Zool. xxiv. p. 117, 1891).

Genus SYBERNA.

Syberna? munita.

Petalochirus munitus, Walk. Cat. Het. viii. p. 9. n. 11 (1873).

This species seems to belong to the genus *Syberna*, with the exception of the anterior tibiæ, which are slightly curved and dilated near base and more slightly dilated at apex. The unique type is not in sufficiently good condition for more precise generic location.

HOLOPTILINÆ.

Genus PTILOCERUS.

Ptilocerus subannulatus.

Maotys subannulatus, Walk. Cat. Het. vii. p. 88. n. 5 (1873).
Maotys simplex, Walk. *loc. cit.* [illegible] 89. n. 7.

Genus HOLOPTILUS.

Holoptilus melanospilus.

Maotys melanospilus, Walk. Cat. Het. vii. p. 88. n. 3 (1873).
Ptilocerus melanospilus, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 93 (1896).

ACANTHASPINÆ.

Genus CENTROCNEMIS.

Centrocnemis philippinensis, sp. n.

Head and pronotum ochraceous; head with a short line in front of the antenniferous tubercles, a median line, two short lateral vittæ, and sides of head behind eyes black; antennæ ochraceous, apex of second and the whole of the third and fourth joints piceous; pronotum with the disk shaded with piceous; scutellum and hemelytra piceous, apex of scutellum and veins of corium pale ochraceous, veins of membrane dull ochraceous; connexivum piceous, its segmental margins, some oblique fasciæ, and many of the marginal spines ochraceous; body beneath and legs piceous; pronotal spines and lateral angles, margins of acetabulæ, coxæ, trochanters, apices of femora, two broad annulations to tibiæ, two central longitudinal series of linear spots, segmental lateral and basal margins, and sublateral oblique vittæ to abdomen, ochraceous. Pronotal angles much dilated, with four long apical spines, of which the two central ones are the most developed.

Long. 23–25 millim.

Hab. Philippines: Saman and Cape Engano (*Whitehead*, Brit. Mus.).

Allied to *C. Signoreti*, Stål; differing by the four spined lateral pronotal angles, different colour of the hemelytra, &c.

Genus ALLŒOCRANUM.

Allœocranum biannulipes.

Opiscœtus biannulipes, Montr. & Sign. Ann. Soc. Ent. Fr. 1861, p. 69.
Reduvius laniger, Butl. Ann. & Mag. Nat. Hist. (4) xvii. p. 411 (1876).

Butler's description does not appear to be recorded by Lethierry and Severin.

Genus CENTROGONUS.

Centrogonus spinicollis.

Acanthaspis spinicollis, Walk. Cat. Het. vii. p. 178. n. 63 (1873).
Vellejus multispinus, Reut. (part.), Rev. d'Entom. vi. p. 162 (1887).

Among the characters not mentioned by Walker in his description are the following:—A rounded black spot on corium near base of membrane and a smaller ochraceous spot at about centre of apical margin to corium.

Genus VARUS.

Varus varius.

Reduvius varius, Walk. Cat. Het. vii. p. 190. n. 37 (1873).

Genus REDUVIUS.

Reduvius semiflavus.

Reduvius semiflavus, Walk. Cat. Het. vii. p. 190. n. 36 (1873).

Corium luteous, with a transverse dark castaneous fascia crossing base of membrane, but not quite reaching the lateral margins, and with its apical angle also castaneous; clavus luteous, with a dark castaneous median longitudinal fascia.

Reduvius humeralis.

Acanthaspis humeralis, Scott, Ann. & Mag. Nat. Hist. (4) xiv. p. 40 (1874).

Closely allied to *R. tenebrosus*, Walk. (Cat. Het. vii. p. 194, 1873), from China. Scott's type is in the British Museum.

Reduvius labeculatus, sp. n.

Brownish ochraceous; head, anterior lobe of pronotum, and scutellum piceous; corium with the veins, a large subbasal spot, two or three small distinct spots at inner angular area, and a spot before apical angles, pale luteous; connexivum alternately ochraceous and piceous; membrane fuliginous, with the veins paler; meso- and metasterna, abdomen beneath, and coxæ dark shining castaneous; legs ochraceous; a central and apical annulation to femora, base and apical area of anterior and intermediate tibiæ, base and apex of posterior tibiæ, and apices of the tarsi, castaneous; antennæ ochraceous, extreme apices of first and second joints castaneous. Pronotum very strongly centrally channelled on disk, its lateral angles obtuse; body moderately pilose, its lateral margins, legs, and antennæ longly pilose.

Long. 15–15½ millim.

Hab. British East Africa: Samburu and Voi (*C. S. Betton*, Brit. Mus.).

Reduvius luteipes, sp. n.

Above piceous; beneath piceous brown; head in front of eyes, connexivum, rostrum, central sulcation to prosternum, acetabula, coxæ, and legs ochraceous; lateral margins of abdomen obscurely paler in hue.

Closely allied to *R. tarsatus*, Germ., from which it differs by the unicolorous legs, the ochraceous connexivum and anterior area of head, lateral lobe of pronotum more finely rugulose, anterior pronotal angles less tubercularly prominent, &c.

Long. 21–22 millim.

Hab. British East Africa: Athi-ya-Mawe (*C. S. Betton*, Brit. Mus.).

Genus LEOGORRUS.

Leogorrus xanthospilus.

Reduvius xanthospilus, Walk. Cat. Het. vii. p. 181. n. 12 (1873).

Leogorrus picturatus.

Leogorrus picturatus, Stål, En. Hem. ii. p. 119 (1872).
Reduvius agnatus, Walk. Cat. Het. vii. p. 184. n. 13 (1873).

Leogorrus pallipes.

Leogorrus pallipes, Stål, En. Hem. ii. p. 119 (1872).
Reduvius crassipes, Walk. Cat. Het. vii. p. 186. n. 15 (1873).

Genus ACANTHASPIS.

Acanthaspis uncinata.

Mardania uncinata, Stål, Œfv. Vet.-Ak. Forh. 1859, p. 189.
Reduvius currifer, Walk. Cat. Het. vii. p. 192. n. 40 (1873).

Acanthaspis bistillata.

Acanthaspis bistillata, Stål, Œfv. Vet.-Ak. Forh. 1858, p. 443.
Acanthaspis pictipes, Walk. Cat. Het. vii. p. 176. n. 52 (1873).
Var. *Acanthaspis picina*, Stål, Ann. Soc. Ent. Fr. 1863, p. 51.

Walker, in his description of his *A. pictipes*, writes:—"Fore wings with a large round luteous spot near the base." He should have written "near apex." Stål's *A. picina*, the type of which is in the British Museum, is a varietal form in which the legs have the red markings very obscure.

Acanthaspis fulvipes.

Platymeris fulvipes, Dall. Trans. Ent. Soc. 1850, p. 6, pl. ii. fig. 3.
Acanthaspis fulvipes, Stål, Ann. Soc. Ent. Fr. 1863, p. 49.
Acanthaspis quadrinotata, Walk. Cat. Het. vii. p 175. n. 49 (1873).
Acanthaspis quadristillata, Stål, MS.

A specimen in the British Museum examined by Stål bears his own label, *A. quadristillatus*, Stål.

Acanthaspis angularis.

Acanthaspis angularis, Stål, Œfv. Vet.-Ak. Förh. 1859, p. 188.
Var. *Acanthaspis helluo*, Kirby (nec Stål), Journ. Linn. Soc., Zool. xxiv. p. 114 (1891).

Corium with a luteous spot at base.

Hab. Ceylon (*Green*).

Acanthaspis sexguttatus.

Reduvius sexguttatus, Fabr. Syst. Ent p. 832 (1775).
Acanthaspis tergemina, Kirby (nec Burm.), Journ. Linn. Soc., Zool. xxiv. p. 114 (1891).

The true *A. tergemina*, Burm., appears to be absent from Ceylon.

Acanthaspis biligata.

Reduvius biligatus, Walk. Cat. Het. vii. p. 195. n. 16 (1873).

Closely allied to *A. flavovaria*, Hahn.

Acanthaspis hieroglyphicus.

Spiniger hieroglyphicus, Walk. Cat. Het. vii. p. 165. n. 60 (1873).

Acanthaspis rubricosa.

Acanthaspis rubricosa, Stål, Œfv. Vet.-Ak. Forh. 1855, p. 39.
Reduvius cruentus, Walk. Cat. Het. vii. p. 192. n. 42 (1873).

Acanthaspis flavovaria.

Reduvius flavovaria, Hahn, Wanz. Ins. ii. p. 18, fig. 126 (1831).
Pirates sculpturatus, Walk. Cat. Het. vii. p. 125. n. 95 (1873).

Acanthaspis lateralis, sp. n.

Head, pronotum, scutellum, connexivum, legs, and body beneath castaneous; corium and membrane piceous; lateral margins of corium (broadest at base and apex) and base of clavus ochraceous; membrane with the veins and margins obscure dull brownish ochraceous.

Head with the postocular area a little longer than the anteocular; pronotum with the anterior lobe deeply furrowed, the posterior lobe rugose, the lateral angles spinously produced and directed backward; scutellum rugose; legs moderately pilose.

Long. 19–20 millim.; exp. pronot. angl. 6 millim.

Hab. Sierra Leone (Brit. Mus.).

Allied to *A. lurco*, Stål.

Acanthaspis divisicollis.

Reduvius divisicollis, Walk. Cat. Het. vii. p. 197. n. 51 (1873).

Genus PLATYMERIS.

Platymeris erebus, sp. n.

Black; antennæ (excluding basal joint) brownish ochraceous; corium with a large discal ochraceous or luteous spot, which almost reaches lateral margin and crosses the basal margin of membrane.

Pronotum with the anterior lobe deeply furrowed but unarmed, the posterior lobe with the lateral angles subacutely prominent and recurved.

Long. 37–40 millim.; exp. pronot. angl. 5½–6 millim.

Hab. Mombasa (Brit. Mus.). Presented by Directors of East African Co. (Brit. Mus.).

The unicolorous black legs will alone distinguish this from any other species of the genus.

KHAFRA, gen. nov.

Body oblong or ovately oblong; head considerably produced in front of eyes, ante- and postocular areas subequal in length; eyes large; ocelli prominent, placed just behind eyes; rostrum with the second joint distinctly longer than the first; antennæ with the first joint considerably passing the apex of the head; pronotum transversely constricted at the base of anterior lobe, the posterior lateral angles more or less spinously prominent or subprominent; scutellum with the lateral margins straight for a short distance from base, thence concavely sinuate to apex, which is produced in a long spine directed hindward, base on each side moderately tuberculate but not spined; legs moderately long and slender, the posterior coxæ furthest apart, anterior tibiæ not provided with a distinct apical spongy furrow; abdomen beneath with a distinct central ridge.

Allied to *Platymeris*.

Type *K. prædo*, Stål.

Khafra prædo.

Platymeris prædo, Stål, Ann. Soc. Ent. Fr. 1863, p. 49.

Hab. Sierra Leone (*Morgan*, Brit. Mus., type); Calabar (*Rutherford*, Coll. Dist.).

Khafra fulvonigra.

Platymeris fulvonigra, Walk. Cat. Het. vii. p. 147. n. 10 (1873).

Hab. East Africa.

This species appears to have been overlooked in the enumeration of Lethierry and Severin.

Khafra concoloripes, sp. n.

Piceous; head, sternum, and rostrum obscure castaneous; legs pale castaneous; antennæ brownish ochraceous, basal joint piceous; lateral angles of pronotum and apex of scutellum castaneous.

Allied to *K. prædo*, Stål, but with the body more elongate and slender, pronotal angles more acute, abdomen without pale margin, legs concolorous, &c.

Long. 27 millim.; exp. pronot. angl. 8 millim.

Hab. S. Nigeria (*D. A. MacAlister*, Brit. Mus.).

Genus Spiniger.

Spiniger truculentus.

Spiniger truculentus, Stål, Rio Hem. i. p. 70. 3 (1860).
Spiniger decoloratus, Walk. Cat. Het. vii. p. 161. n. 58 (1873).

Spiniger rufescens.

Spiniger rufescens, Stål, Stett. ent. Zeit. xx. p. 401. 23 (1859).
Spiniger rutilans, Walk. Cat. Het. vii. p. 161. n. 52 (1873).

Walker's description of his *S. rutilans* is inexact. The head is not black, but only discoloured; the clavus and membrane are not black, but brownish grey, and that colour extends beyond the clavus to the claval marginal area of the corium.

Spiniger spinidorsis.

Reduvius spinidorsis, Gray, Griff. Anim. Kingd. xii. p. 244, pl. xci. fig. 1 (1832).
Spiniger lutescens, Walk. Cat. Het. vii. p. 160. n. 49 (1873).

Spiniger pictus.

Spiniger pictus, Walk. Cat. Het. vii. p. 160. n. 50 (1873).

Closely allied to *S. eburneus*, Lepell. & Serv.

Spiniger tenebrifer.

Reduvius tenebrosus, Walk. Cat. Het. vii. p. 185. n. 15 (1873).
Spiniger tenebrosus, Champ. Biol. Centr.-Amer., Rhynch. ii. p. 198 (1899), note.
Reduvius tenebrifer, Walk. *loc. cit.* p. 205.

A species probably synonymic with one previously described, and here only denoted in its proper genus.

Spiniger nothus, sp. n.

Spiniger maculifer, Walk. (part.), Cat. Het. vii. p. 162. n. 51 (1873).
Spiniger pulchellus, Walk. (part.), *loc. cit* p. 163. n. 56.

The series of specimens thus identified by Walker represent two species. A reference to the description of *pulchellus* will show that Walker has described the hind lobe of the pronotum twice over, which refers to two species, while under the description of *S. maculifer* he has correctly given the spotted under surface of the larger species and its correct dimensions, with other characters which do not apply to anything else to be found.

Head, pronotum, scutellum, body beneath, and legs black; head from between the eyes, second joint of antennæ, tubercular anterior angles, two long discal spines, and a short tubercular spine on each lateral margin of anterior pronotal lobe, a central subbasal fascia and the lateral areas and spines of posterior pronotal lobe, scutellar spine, basal angle of corium, coxæ, acetabula, two large discal spots (sometimes united) on second, third, and fourth abdominal segments, and small elongate spots on abdominal margin, luteous; hemelytra cinnamon-brown; corium with a pale narrow subcostal luteous fascia.

Anterior lobe of pronotum with two long ascending discal spines, the anterior angles spinously tuberculate, and with a short tubercle on each lateral margin; lateral angles of posterior lobes longly, straightly, spinously produced; scutellar spine long, nearly perpendicular.

Long. 24–29 millim.; exp. pronot. angl. 7½–9 millim.

Hab. Amazons (Brit. Mus.).

Spiniger mixtus, sp. n.

Spiniger pulchellus, Walk. (part.), Cat. Het. vii. p. 163. n. 56 (1873).

Black; a broad anterior fascia to posterior lobe of pronotum and occupying the lateral angles, base and lateral margins to corium, ochraceous; a transverse fascia to corium near base of membrane and abdomen beneath stramineous; sternum and legs black; under surface of basal joint of rostrum, central fascia to head beneath, under surfaces of anterior and intermediate femora, and coxæ stramineous; posterior margin to prosternum and a posterior spot on each side of mesosternum ochraceous; anterior lobe of pronotum with two long erect black spines, their bases ochraceous, the anterior angles tuberculate; lateral angles of posterior lobe with a somewhat long black spine directed a little backward, their bases ochraceous; scutellar spine long, black, perpendicular.

Long. 15 millim.; exp. pronot. angl. 5 millim.

Hab. Amazons (*Bates*, Brit. Mus.).

Genus Cerilocus.

Cerilocus nero.

Cerilocus nero, Stål, Œfv. Vet.-Ak. Förh. 1858, p. 443.
Reduvius decisus, Walk. Cat. Het. vii. p. 191. n. 39 (1873).

Cerilocus histrio, sp. n.

Black; a large ochraceous spot near inner angle of corium; antennæ (excluding basal joint), apices of tibiæ, and the tarsi brownish ochraceous; eyes and ocelli more or less stramineous, apical margin of membrane greyish white. Pilose, especially the antennæ and legs; pronotum with the anterior angles nodulosely prominent, the disk of both lobes centrally impressed, posterior lateral angles subprominent and rounded; first joint of antennæ short, barely reaching apex of head, about one fourth the length of second joint; first and second joints of rostrum subequal in length.

Long. 22 millim.; exp. pronot. angl. 6½ millim.

Hab. British East Africa (*C. S. Betton*, Brit. Mus.).

Mankuninga, gen. nov.

Body elongate, depressed; head well produced in front of eyes, where it is profoundly longitudinally sculptured; antennæ with the first joint short, not reaching apex of head and about one fourth the length of second joint; rostrum with the first joint slightly shorter than the second; pronotum narrowed anteriorly, transversely constricted before middle, the anterior lobe sculptured and longitudinally impressed, the posterior lobe not or very obsoletely longitudinally impressed, lateral angles rounded; scutellum a little shorter than broad; legs very long, posterior tibiæ extending beyond the apex of the abdomen for rather more than half their length; anterior femora moderately incrassated but unarmed; anterior tibiæ provided with a profound apical spongy fovea; prosternum centrally sulcate; abdomen convex beneath and centrally ridged.

This genus is allied to *Cerilocus*, Stål, from which it differs by the sculptured anterior lobe of the pronotum, by the length of the posterior tibiæ, the convex abdomen beneath, &c.

Mankuninga longipes, sp. n.

Black above, piceous brown beneath; a large rounded discal spot near inner angle of corium and the legs ochraceous; femoral apices, bases of posterior femora, tibiæ and tarsi brownish ochraceous; lateral abdominal margins ochraceous, spotted with brown; legs and antennæ somewhat longly pilose.

Long. 25 millim.; exp. pronot. angl. 7 millim.

Hab. British East Africa (*C. S. Betton*, Brit. Mus.).

Genus VELITRA.

Velitra rubropicta.

Opinus rubropicta, Amy. & Serv. Hém. p. 339 (1843).
Reduvius rivulosus, Walk. Cat. Het. vii. p. 194. n. 45 (1873).

Velitra subfasciatus.

Reduvius subfasciatus, Walk. Cat. Het. vii. p. 200. n. 63 (1873).

Velitra sinensis.

Reduvius sinensis, Walk. Cat. Het. vii. p. 196. n. 49 (1873).

Described from China; also received from Ceylon.

Velitra marginata.

Velitra marginata, Sign. Ann. Mus. Civ. Stor. Nat. Genov. xv. p. 544 (1880).
Velitra fuscinervis, Reut. Act. Soc. Sc. Fennic. xii. p. 322 (1881).

Genus LENÆUS.

Lenæus pyrrhus.

Lenæus pyrrhus, Stål, Œfv. Vet.-Ak. Förh. 1859, p. 187.
Opinus rugicollis, Walk. Cat. Het. viii. p. 3. n. 14 (1873).

Walker has misdescribed this species. The antennæ are not black, but the second and third joints are fuscous, the first, and base of second, testaceous.

Genus SMINTHUS.

Sminthus singularis.

Reduvius singularis, Walk. Cat. Het. vii. p. 198. n. 53 (1873).

Sminthus unifasciatus.

Reduvius unifasciatus, Walk. Cat. Het. vii. p. 201. n. 64 (1873).

Sminthus Greeni, sp. n.

Pale sanguineous; head in front of eyes, eyes, area of the ocelli, a small spot on each side of base, anterior lobe of pronotum (excluding base), lateral margins of posterior lobe, corium, membrane, connexivum, prosternum, lateral margins of meso- and metasterna, lateral areas of abdomen beneath, apices of the femora, and under surfaces of anterior and intermediate femora piceous; tibiæ ferruginous; antennæ brownish ochraceous, apical joint and base and apex of second joint piceous; base of corium and clavus sanguineous. Posterior lobe of pronotum with three distinct longitudinal impressions; base of scutellum centrally sulcate.

Long. 17 millim.

Hab. Ceylon (*Green*, Brit. Mus.).

Genus STALIASTES.

Staliastes rufus.

Tapeinus rufus, de Casteln. Essai, p. 82, ♀ (1832).
Opinus semicostalis, Walk. Cat. Het. viii. p. 4. n. 16 (1873).

Staliastes strigifer.

Opinus strigifer, Walk. Cat. Het. viii. p. 3. n. 14 (1873).

The antennæ are not black as described by Walker, but pale fuscous, excluding basal joint and base of second joint.

Genus DURGANDA.

Durganda nigripes.

Opinus nigripes, Walk. Cat. Het. viii. p. 4. n. 17 (1873).

Durganda Signoreti, nom. nov.

Durganda nigripes, Sign. (nom. præocc.), Ann. Mus. Civ. Stor. Nat. Genov. xv. p. 543 (1880).

Genus TIARODES.

Tiarodes obyanus, sp. n.

Sanguineous; head, fifth and sixth segments and apex of abdomen bluish black; corium (excepting basal angle) and the membrane black; legs brownish, finely ochraceously pilose, femora bluish-black above; connexivum sanguineous, with the last two segments bluish black; head with an ochraceous collar; antennæ with the first and second joints bluish black, third joint brownish ochraceous; head faintly transversely striate; anterior pronotal angles obtusely prominent, transverse incision profound, lateral posterior angles broadly rounded; lateral margins of connexivum faintly rugulose.

Long. 11 millim.

Hab. Oby Island, near New Guinea (Brit. Mus.).

Allied to *T. Kukenthali*, Bredd.

Genus LAMUS.

Lamus lignarius.

Conorhinus lignarius, Walk. Cat. Het. viii. p. 17. n. 28 (1873).
Eratyrus lignarius, Leth. & Sev. Cat. Gén. Hém. t iii. p. 117 (1896).

Mr. Champion (Biol. Centr.-Am., Rhynch. ii. p. 206, note) previously suggested the placing of this species in the genus *Lamus*.

Lamus megistus.

Conorhinus megistus, Burm. Handb. ii. p. 246 (1835).
Conorhinus porrigens, Walk. Cat. Het. viii. p. 19. n. 29 (1873).

MARLIANUS, gen. nov.

Allied to *Rhodnius*, Stål. Head long, cylindrical, apex with a short spine or tubercle on each side; antennæ inserted at less than one half from apex, first joint short, not nearly reaching apex of head, second joint longer than first or third; rostrum with the first and second joints almost subequal in length; pronotum moderately constricted, unarmed on disk; posterior angles subprominent and rounded, anterior lobe centrally sulcate, posterior lobe centrally bicarinate; connexivum moderately convexly produced; hemelytra not quite reaching apex of abdomen.

Marlianus diminutus.

Conorhinus diminutus, Walk. Cat. Het. viii. p. 19. n. 30 (1873).

Hab. Venezuela (*Dyson*, Brit. Mus.).

Summarized Disposition of Walker's Genera and Species belonging to the Fam. **Reduviidæ** (*part.*).

Species considered valid and described under correct Genera.

Spiniger leucotelus, Walk. Cat. Het. vii. p. 159. n. 47 (1873).
—— *sigillatus*, Walk. *loc. cit.* n. 48.
—— *pictus*, Walk. *loc. cit.* p. 160. n. 50.

Spiniger basalis, Walk. *loc. cit.* p. 161. n. 51.
—— *umbrifer*, Walk. *loc. cit.* p. 162. n. 53.
—— *pardalinus*, Walk. *loc. cit.* p. 164. n. 57.
Acanthaspis aliena, Walk *loc. cit* p. 171. n. 26.
—— *luteipes*, Walk. *loc. cit.* p. 175. n. 50.
—— *megaspilus*, Walk. *loc. cit.* p. 176. n. 53.
—— *dubius*, Walk. *loc. cit.* p. 177. n. 54.
—— *micrographa*, Walk. *loc. cit.* n. 55.
Reduvius semiflavus, Walk. *loc. cit.* p. 190. n. 36.
—— *tenebrosus*, Walk. *loc. cit.* p. 194. n. 44.
—— *debilis*, Walk. *loc. cit.* p. 202. n. 67.
Tiarodes juncturus, Walk. *loc. cit.* viii. p. 7. n. 6 (1873).
Oncocephalus ventralis, Walk. *loc. cit.* p. 24. n 6.
Pygolampis unicolor, Walk. *loc. cit.* p 36. n. 18.
—— *macera*, Walk. *loc. cit.* p. 37. n. 20.
—— *australis*, Walk. *loc. cit.* p. 38. n. 21.

Species considered valid, but requiring generic revision.

Maotys viverra, Walk. Cat. Het. vii. p. 88. n. 2 (1873), belongs to gen. *Holoptilus*.
—— *melanospilus*, Walk. *loc. cit.* n. 3, belongs to gen. *Holoptilus*.
—— *venosus*, Walk. *loc. cit.* n. 4, belongs to gen. *Ptilocerus*.
—— *subannulatus*, Walk. *loc cit.* n. 5, belongs to gen. *Ptilocerus*.
—— *guttifer*, Walk. *loc cit.* p. 89. n. 6, belongs to gen. *Ptilocerus*.
Platymeris fulvonigra, Walk. *loc. cit.* p. 147. n. 10, belongs to gen. *Khafra*, g. n.
Spiniger hieroglyphicus, Walk. *loc. cit.* p. 165. n. 60, belongs to gen. *Acanthaspis*.
Acanthaspis inornata, Walk. *loc. cit.* p. 175. n. 51, belongs to gen. *Lisarda*.
—— *spinicollis*, Walk. *loc. cit.* p. 178. n. 63, belongs to gen. *Centrogonus*.
Reduvius pallescens, Walk. *loc. cit* p. 183. n. 9, belongs to gen. *Sphæridops*.
—— *xanthospilus*, Walk. *loc. cit.* p. 184. n. 12, ,, ,, *Leogorrus*.
—— *tenebrosus*, Walk. *loc. cit.* p. 185. n. 15, ,, ,, *Spiniger*.
—— *varius*, Walk. *loc. cit.* p. 190. n. 37, ,, ,, *Varus*.
—— *biligatus*, Walk. *loc. cit.* p. 195. n. 46, ,, ,, *Acanthaspis*.
—— *sinensis*, Walk. *loc. cit.* p. 196. n. 49, ,, ,, *Velitra*.
—— *divisicollis*, Walk. *loc cit.* p. 197. n. 51, ,, ,, *Acanthaspis*.
—— *conspersus*, Walk. *loc. cit.* p. 197. n. 52, ,, ,, *Lisarda*.
—— *singularis*, Walk. *loc. cit.* p. 198. n. 53, ,, ,, *Sminthus*.
—— *annularis*, Walk. *loc. cit.* p. 199. n. 60, ,, ,, *Lisarda*.
—— *lineatus*, Walk. *loc. cit.* p. 200. n. 61, ,, ,, *Oncocephalus*.
—— *subfasciatus*, Walk. *loc. cit.* n. 63, ,, ,, *Velitra*.
—— *unifasciatus*, Walk. *loc. cit.* p. 201. n. 64, ,, ,, *Sminthus*.
—— *incommodus*, Walk. *loc. cit.* p. 204. n. 71, ,, ,, *Leogorrus*.
Opinus strigifer, Walk. *loc. cit.* viii. p. 3. n. 14, ,, ,, *Staliastes*.
—— *nigripes*, Walk. *loc. cit.* p. 4. n. 17, ,, ,, *Durganda*.
Petalochirus munitus, Walk. *loc cit.* p. 9. n. 11, ,, ,, *Sylberna*?
Conorhinus lignarius, Walk. *loc. cit.* p. 17. n. 26, ,, ,, *Lamus*.
—— *diminutus*, Walk. *loc. cit* p. 19. n. 30, ,, ,, *Marlianus*, g. n.
Opistoplatys indicus, Walk. *loc. cit.* p. 20. n. 2, ,, ,, *Tribelocephala*.

Sastrapada longicollis, Walk. *loc. cit.* p. 28. n. 8, belongs to gen. *Ctenotrachelus.*
—— *filiformis*, Walk. *loc. cit.* p. 29. n. 9, „ „ *Pnirontis.*
Stenopoda hyalinipennis, Walk. *loc. cit.* p. 31. n. 10, „ „ Gen. ?

Species treated as synonymic.

Maotys simplex, Walk. Cat. Het. vii. p. 89. n. 7 (1873), = *Ptilocerus subannulatus*, Walk.
Spiniger lutescens, Walk. *loc. cit.* p. 160. n. 49, = *Spiniger spinidorsis*, Gray.
—— *rutilans*, Walk. *loc. cit.* p. 161. n. 52, = *Spiniger rufescens*, Stål.
—— *maculifer*, Walk. (part.), *loc. cit.* p. 162. n. 54, = *Spiniger nothus*, Dist
—— *pulchellus*, Walk. (part.), *loc. cit.* p. 163. n. 56, = *Spiniger mixtus*, Dist.
—— ——, Walk. (part.), = *Spiniger nothus*, Dist.
—— *decoloratus*, Walk. *loc. cit.* p. 164. n. 58, = *Spiniger truculentus*, Stål.
—— *naboides*, Walk. *loc. cit.* p. 165. n. 59, = *Vescia spicula*, Stål.
Acanthaspis quadrinotata, Walk. *loc. cit.* p. 175. n. 49, = *Acanthaspis fulvipes*, Dall.
—— *pictipes*, Walk. *loc. cit.* p. 176. n. 52, = *Acanthaspis bistillata*, Stål.
Reduvius signifer, Walk. *loc. cit.* p. 182. n. 8, = *Leogorrus litura*, Fabr.
—— *partitus*, Walk. *loc. cit.* p. 183. n. 10, = *Leogorrus litura*, Fabr.
—— *lugubris*, Walk. *loc. cit.* n. 11, = *Leogorrus formicarius*, Fabr.
—— *signatus*, Walk. *loc. cit.* p. 184. n. 13, = *Leogorrus picturatus*, Stål.
—— *plagipennis*, Walk. *loc. cit.* p. 186. n. 16, = *Leogorrus formicarius*, Fabr.
—— *areolatus*, Walk. *loc. cit.* n. 17, = *Leogorrus formicarius*, Fabr.
—— *crassipes*, Walk. *loc. cit.* n. 18, = *Leogorrus pallipes*, Stål.
—— *decisus*, Walk. *loc. cit.* p. 191. n. 39, = *Cerilocus nero*, Stål.
—— *curvifer*, Walk. *loc. cit.* p. 192. n. 40, = *Acanthaspis uncinata*, Stål.
—— *turpis*, Walk. *loc. cit.* n. 41, = *Lisarda canosa*, Stål.
—— *cruentus*, Walk. *loc. cit.* n 42, = *Acanthaspis rubricosa*, Stål.
—— *rivulosus*, Walk. *loc. cit.* p. 194. n. 45, = *Velitra rubropicta*, A. & S.
—— *argillaceus*, Walk. *loc. cit.* p. 195. n. 47, = *Lisarda rhypara*, Stål.
—— *funereus*, Walk. *loc. cit.* p. 203. n. 68, = *Opistoplatys australasiæ*, Westw.
Opinus pygmæus, Walk. *loc. cit.* viii. p. 1. n. 3, = *Microlestria plebeja*, Stål.
—— *acuticeps*, Walk. *loc. cit.* p. 2. n. 4, = *Tribelocephala Boschjesmana*, Stål.
—— *rugicollis*, Walk. *loc. cit.* p. 3. n. 15, = *Lenæus pyrrhus*, Stål.
—— *semicostalis*, Walk. *loc. cit.* p. 4 n. 16, = *Stahastes rufus*, de Casteln.
Petalochirus funestus, Walk. *loc. cit.* p. 9. n. 10, = *Valentia apetala*, de Vuill.
—— *singularis*, Walk. *loc. cit.* p. 10. n. 12, = *Petalochirus malayus*, Stål.
Conorhinus corticalis, Walk. *loc. cit.* p. 17. n. 25, = *Lamus geniculatus*, Latr.
—— *limosus*, Walk. *loc. cit.* p. 18. n. 27, = *Rhodnius prolixus*, Stål.
—— *porrigens*, Walk. *loc. cit.* p. 19. n. 29, = *Lamus megistus*, Burm.
Sastrapada bipunctata, Walk. *loc. cit.* p. 28. n. 7, = *Sastrapada Baerensprungi*, Stål.
Stenopoda hastata, Walk. *loc. cit.* p. 32. n. 14, = *Thodelmus Falleni*, Stål.
Pygolampis innotata, Walk. *loc. cit.* p. 36. n. 17, = *Sastrapada Baerensprungi*, Stål.

To be treated as non-existent.

Species the types of which are not now to be found in the British Museum.

Spiniger bipustulatus, Walk. Cat. Het. vii. p. 163. n. 55 (1873).
Acanthaspis inæqualis, Walk. *loc. cit.* p. 168. n. 5.
Reduvius pyrrhophorus, Walk. *loc. cit.* p. 196. n. 48.
Conorhinus arenarius, Walk. *loc. cit.* viii. p. 18. n. 28.
Pygolampis concolor, Walk. *loc. cit.* p. 37. n. 10.

XXVIII.—*A Revision of the Fishes of the Family* Stromateidæ. By C. Tate Regan, B.A.

[Concluded from p. 131.]

CENTROLOPHUS.

Centrolophus, Lacep. Hist. Nat. Poiss. iv. p. 441 (1802).
Pompilus, Lowe, Proc. Zool. Soc. 1839, p. 81.

This genus is distinguished from *Lirus* by the elongated body and the maxillary slipping under the præorbital for the entire length of its upper edge. The spines of the dorsal and anal are slender, indistinct, and graduating. Seven branchiostegals. 25 vertebræ.

Synopsis of the Species.

a. Lateral line with a short curve above the pectoral, thence running along the middle of the body. D. 45. A. 30	1. *C. brittanicus.*
b. Lateral line with a rather long curve. D. 37–41. A. 23–25.	
Dorsal fin rounded..........................	2. *C. niger.*
Dorsal fin slightly emarginate in its posterior half.	3. *C. maoricus.*

Centrolophus brittanicus, Gthr.

Centrolophus brittanicus, Günther, Cat. ii. p. 402 (1860).

This species is known only from one specimen from Polperro, Cornwall, which is not well stuffed, so that accurate measurements are not possible. The body seems to be rather more elongated than in *C. niger*, the head rather smaller. D. 45. A. 30. The fin-rays are broken off short. The base of the dorsal is longer relatively to the total length of the body, the base of the anal shorter than in *C. niger*. Lateral line with a short curve above the pectoral, then running along the middle of the body. In other characters very similar to *C. niger*.

Total length 520 millim.

Centrolophus niger, Gmelin.

Centrolophus pompilus, Cuv. & Val.

To synonymy given by Jordan & Evermann, Fishes N Amer. p. 963, add :—

Schedophilus elongatus, Johnson, Proc. Zool. Soc. 1862, p. 175.

Depth of body about 4 times in total length, length of head 4⅓ to 5 times. Snout as long as or a little longer than the eye, the diameter of which is 4–4¾ times in length of head. Interorbital width about 3½ times in length of head. Maxillary extending to below anterior quarter of eye. Caudal peduncle 1¾ to 2 times as long as deep. D. 37–41, with a few indistinct spines anteriorly; the rays increasing in length to about the twelfth, thence decreasing to the last. A. III 20–22. Pectorals about ¾ the length of head, longer than ventrals. Caudal slightly forked. Sc. 185–205 $\frac{23\text{–}28}{58\text{–}70}$, rather deciduous in the adult, each scale pierced by a pore. Lateral line with a long curve, becoming straight above the origin of the anal. Dark brown.

Total length 480 millim.

Mediterranean and North Atlantic.

**Centrolophus maoricus.*

Centrolophus maoricus, Ogilby, Rec. Austral. Mus. ii. 1893, p. 64.

Depth of body 4 times in total length, length of head 4½ times. Snout a little longer than the eye, the diameter of which is a little more than 4 times in the length of head and rather less than the interorbital width. Maxillary reaching to below anterior quarter of orbit. D. 38, the rays increasing in length to the twelfth to fourteenth, then becoming abruptly shorter, the posterior part of the fin being emarginate. A 25, exactly half as long as the dorsal. Pectoral less than half the length of head; ventrals as long as the snout. Scales small, each pierced by a central circular pore. Lateral line decurved, becoming straight below the highest part of the dorsal. Uniform brown, darkest above; the sides of the head washed with dull blue, the fins and opercles with gold.

New Zealand.*

LIRUS.

Leirus, Lowe, Proc. Zool. Soc. i. p 143 (1833).

†*Mupus*, Cocco.

†*Schedophilus*, Cocco, Giorn. Innom. Mess. An. 3, No. 57, p. 57 (1834).

Crius, Valenc. in Webb & Berthel. Hist. Nat. I. Can., Poiss. ii. pt. 2, p. 45 (1836–44).

Palinurus, Dekay, Zool. N. York, iv. p. 118 (1842).
Hyperoglyphe, Günther, Cat. i. p. 337 (1859).
Palinurichthys, Gill, Proc. Ac. Philad. 1860, p. 20.
Pammelas, Gunther, Cat. ii. p. 485 (1860).

Body ovate or oblong-ovate, compressed; mouth small or moderate; palate without teeth; premaxillaries slightly protractile; maxillary more or less exposed, with small supplemental bone. Upper surface of head with a spongy porous integument; præoperculum generally distinctly spinate, sub- and interopercles denticulated. Five to seven branchiostegals; pseudobranchiæ present; gill-membranes not united; gill-rakers long. Scales small; lateral line curved anteriorly, becoming straight before reaching the caudal peduncle. Dorsal with IV–IX 19–46 rays. Anal with III 16–27 rays. Pectorals with 19–22 rays. Caudal forked or emarginate. Vertebræ 25.

Synopsis of the Species.

A. Dorsal spines graduating to the higher soft rays.
  a. Dorsal rays decreasing in length posteriorly.
    D. IV 41–46. A. III 24–27. Sc. 136–148 $\frac{26-30}{60-70}$. 1. *L. medusophagus*.
    D. VIII–IX 27–30. A. III 21–24. Sc. 100–108 $\frac{21-22}{45-47}$ .... 2. *L. maculatus*.
    D. VI–VII 29–33. A. III 21–24. Sc. 95–110 $\frac{13-16}{30-37}$ .... 3. *L. ovalis*.
    D. VIII–IX 26–28. A. III 18. Sc. 80–90 $\frac{12-14}{21-30}$. 4. *L. peruanus*.
    D. VIII 21. A. III 16. Sc. 75 .... 5. *L. Valenciennesi*.
  b. Dorsal rays increasing in length to the last.
    D. VIII 28. A. III 18 .... 6. *L. rotundicauda*.
B. Dorsal spines short, not graduating to the higher soft rays. D. VII–IX 19–24. A. III 16–21.
  a. Lateral line becoming straight above origin of anal .... 7. *L. japonicus*.
  b. Lateral line becoming straight above middle of anal .... 8. *L. paucidens*.
  c. Lateral line becoming straight above last part of anal.
    Dorsal spines increasing in length to the fourth, thence subequal .... 9. *L. perciformis*.
    Dorsal spines increasing in length to the fourth, thence decreasing .... 10. *L. porosus*.

Lirus medusophagus.

†*Schedophilus medusophagus*, Cocco, Giorn. Innom. Mess. Ann. iii. 1834, No. 27, p. 57.

Depth of body 2¼ to 2½ times in total length, length of head 3 to 4 times. Snout as long as eye, the diameter of which is 3 to 4 times in the length of head and less than the interorbital width. Maxilla extending to below middle of eye. D. 45–50, spines not distinct, rays increasing in length to about the twentieth, thence subequal to about the fortieth, thence decreasing rapidly to the last, the whole fin rounded. A. 27–30. Caudal rounded, its posterior border slightly emarginate. In very young specimens (35 millim.) the pectorals are rounded, shorter than the ventrals, which extend to about the fifth anal ray and equal the head in length; the longest dorsal rays are equal to $\frac{3}{5}$ the depth of the body. In larger specimens (100 millim.) the ventrals reach the anus and the longest dorsal ray is equal to $\frac{4}{5}$ the depth of body; in these the pectorals are broken. In a specimen figured by Günther (Trans. Zool. Soc. xi. p. 221, 1881), which is 240 millim. in total length, the ventrals appear to be less than half the length of the head, much shorter than the pectorals, which are no longer rounded, but have the upper rays longest; while the dorsal and anal fins are comparatively low. Sc. 136–148 $\frac{26-30}{60-70}$. Lateral line curved anteriorly, becoming straight below the twelfth dorsal ray.*

Pale olive, marbled with darker; vertical fins punctulated with black.

Total length 100 millim.

Pacific, Atlantic, Mediterranean.

Lirus maculatus.[1]

Schedophilus maculatus, Gunther, Cat. ii. p. 412 (1860).
Schedophilus marmoratus, Kner, SB. Ak. Wien, liv. 1866, p. 306.

Depth of body 2 to $2\frac{1}{3}$ times in total length, length of head $3\frac{1}{5}$ to $3\frac{1}{3}$ times. Snout $\frac{1}{2}$ to $\frac{2}{3}$ of the diameter of the eye, which is 3 to $3\frac{1}{4}$ times in the length of head and equal to the interorbital width. Maxillary scarcely reaches vertical from middle of eye. D. VIII–IX 27–30, the spines distinct and increasing in length to the last, the soft rays increasing in length to about the tenth, thence decreasing, the whole fin rounded. A. III 21–24, rounded. Ventrals extending beyond anus and nearly equal to length of head in specimens 44 millim. long, $\frac{5}{7}$ of the distance from their origin to the anus and $\frac{5}{6}$ the length of head in specimens 90 millim. long. Pectorals rounded. Sc. 100–108 $\frac{21-22}{45-47}$. Lateral line with a long curve, becoming straight below the last quarter of the dorsal. Caudal apparently emarginate. Pale yellowish brown, with a purple tinge above, silvery beneath. Large blotches and bands of darker reddish brown, which extend on to the dorsal and anal fins, and also on the ventrals and caudal, this latter always with a large brown spot at the base of each lobe.

Total length 44 millim.

Chinese Seas, South Seas, coasts of Australia.

Lirus ovalis.

Centrolophus ovalis, Cuv. & Val. ix. p. 346 (1833).
Centrolophus crassus, Cuv. & Val. *t. c.* p. 348.
†*Mupus imperialis*, Cocco.
Leirus Bennettii, Lowe, Trans. Camb. Phil. Soc. vi. 1834, p. 199, tab. v.
Crius Bennettii, Valenc. in Webb & Berthel. Hist. Nat. I. Canar., Poiss. ii pt. 2, p. 43 (1836–44).
Crius Berthelotii, Valenc. *l. c.* p. 45, pl. ix.
Pompilus Bennettii, Lowe, Proc. Zool. Soc. 1839, p. 82.
Schedophilus Berthelotii, Gunther, Cat. ii. p. 412 (1860).
Centrolophus porosissimus, Canestr. Mem. Acc. Tor. xxi. 1864, p. 305, pl. ii.
Schedophilus Botteri (Heck.), Steind. SB. Ak. Wien, lvii. 1868, p. 379.

It has twice happened that the same author has described a young and an adult example of this species as two different species, Valenciennes describing a specimen 170 millim. long as *Crius Berthelotii* and one of 600 millim. as *Crius Bennettii*, and Canestrini one of about 250 millim. as *Centrolophus porosissimus* and one of 440 millim. as *Centrolophus crassus*. Even allowing for the changes which take place during growth, some of the measurements given as to the height of the dorsal fin and the size of the eye are outside the limit for the species; this is probably due to different methods of measurement, and when the height of the dorsal fin is stated as ⅓ the depth of body, it was probably measured with the fin laid back and not extended, or else from the upper edge of the scaly sheath, this latter being included in the body depth; which would be a very natural error in large specimens, in which it is difficult to find the bases of the fin-rays. The eye in this species and throughout the family has a prominent circular lid, which extends to the outer margin of the iris, and it often happens in preserved specimens that this lid is torn or shrunk, thus apparently enlarging the size of the eye.

I append in tabular form the measurements o[illegible]he specimens in the British Museum Collection and those described by various authors. The numbers in the various columns give in millimetres:—A, total length with caudal, and B, without caudal; C, depth of body; D, length of head, and E, of snout; F, eye-diameter; G, longest dorsal ray; H, length of pectoral, and K, of ventral; L, M, and N give the number of rays in the dorsal and anal fins and the number of scales.

Specimens in Brit. Mus. Coll.	A.	B.	C.	D.	E.	F.	G.	H.	K.	L.	M.	N
Schedophilus Bertheloti	175	135	56	40	9	10	35	28	35	VII 29	III 22	98 $\frac{15}{37}$
Centrolophus ovalis	220	177	73	50	12·5	11	37	40	40	VII 32	III 21	95 $\frac{14}{35}$
	240	200	79	54	13·5	12	43	43	44	VII 33	III 23	105 $\frac{14}{34}$
Schedophilus Berthelotii	420	340	125	92	22	19	55	80	53	VI 29	III 20	100 $\frac{16}{36}$
	470	380	140	110	29	23	60	97	54	VII 80	III 22	110 $\frac{14}{32}$
Specimens as described.												
Schedophilus Botteri	64	. .	21	16	3	6	. .	. .	12	36	23	. .
Crius Berthelotii	170	. .	57	40	12	12	34	28	35	IV 34	III 22	100
Centrolophus porosissimus . .	.	215	94	62	15	15	40	50	54	VI 30	III 22	. .
Centrolophus crassus	440	365	130	100	25	25	43	. .	. .	VI 31	III 22	. .
Crius Bennettii	600	. .	200	120	. .	(40)	(24)	120	½ way to anus	VII 31	III 25	(80)

The interorbital width is 2⅔ to 3 times in the length of head; maxillary extending to below anterior quarter of eye; caudal peduncle about as long as deep. The dorsal originates above the opercular cleft, and the rays increase in height to about the seventeenth, the whole fin being rounded. The caudal is slightly emarginate in the young, moderately forked in the adult. The lateral line has a long curve, becoming straight below about the twenty-sixth ray of the dorsal. Gill rakers as long as gill-fringes, 16 on the lower part of the anterior arch. Præoperculum distinctly spinate in the young. Scales loosely inserted, numerous pores on the body which do not pierce the scales. Greenish brown above, silvery below; fins brown; the young with purplish spots on the sides, which are still present in a specimen 175 millim. in total length.

Atlantic; Mediterranean.

**Lirus peruanus.*

Centrolophus peruanus, Steind. SB. Ak. Wien, lxx. 1875, p. 384.

Depth of body 3¼ times in total length, length of head 3 times. Snout a little longer than the eye, the diameter of which is 5 times in the length of head, interorbital width 2⅓ to 2⅔ times. Maxillary extending to below anterior margin of eye. D. VIII–IX 26–28, spines graduating to the higher soft rays, the soft fin highest anteriorly, the longest rays ½ to ⅔ of the length of head. A. III. 18, similar to soft dorsal. Pectorals falciform, as long as the head. Ventrals short, inserted behind the pectorals. Caudal lunate. Sc. 80–90 $\frac{12-14}{24-30}$. Upper part of the body with dorsal and pectoral fins dark violet; lower part of body with anal and ventral fins golden, usually with small violet spots; sometimes violet streaks extending down from the ground-colour of the back over the sides.

Coast of Peru, in deep water. Common in the market at Callao.

Lirus Valenciennesi.

Centrolophus Valenciennesi, Moreau, Poiss. France [illegible] p. 496, fig. 138 (1881).

This species is said to differ from *L. ovalis* in the lesser number of rays in the dorsal and anal. D. VIII 21. A. III 16. Sc. 75.

Mediterranean (Marseilles).

**Lirus rotundicauda.*

Centrolophus rotundicauda, Costa, Ann Mus. Zool. Nap vi 1866, p. 84, tab. i.

Depth of body 3 times in total length, length of head $3\frac{3}{4}$ times. Snout as long as the eye, the diameter of which is 4 times in the length of head. D. VIII 28, the rays gradually increasing in length to the last, which is equal in length to $\frac{2}{3}$ the depth of the body below, and when laid back extends to the base of the caudal. A. III 18. Pectorals as long as ventrals, $\frac{2}{3}$ the length of head. Caudal slightly emarginate, with rounded lobes. Sc. 85/30. Dull greenish above, silvery below, with obscure darker patches.

Total length 300 millim.

A single specimen from the Bay of Naples.

It seems chiefly to differ from *L. ovalis* in the form of the dorsal fin.

**Lirus japonicus.*

Centrolophus japonicus, Steind. Denk. Ak. Wien, xlix. 1885, p. 183.

Depth of body about equal to the length of head, about 3 times in the total length. Snout $\frac{3}{5}$ of the eye-diameter, which is 3 times in the length of head and equal to the interorbital width. Maxillary extending to below the middle of the eye. Præoperculum denticulated. D. VIII 22, the spines short and weak, the last the highest and $\frac{1}{4}$ the length of head; anterior soft rays highest, $2\frac{2}{3}$ times in the length of head. A. III 19. Pectorals reach the anus. Ventrals inserted behind the pectorals, reaching halfway to the anal. Scales small, rather deciduous, 98–100 in a longitudinal series. Lateral line decurved, becoming straight above the origin of the anal. Grey-brown, dark above, clear below.

Total length 420 millim.

Seas of Japan.

Lirus paucidens.

Lirus paucidens, Gunther, 'Challenger' Pelagic Fishes, p. 11, pl. ii. (1888).

Depth of body 2 to $2\frac{1}{3}$ times in total length, length of head $2\frac{1}{2}$ times. Snout shorter than eye, the diameter of which is about 3 times in length of head, less than interorbital width. Maxilla reaches to nearly below middle of eye. Caudal peduncle as long as deep. D. VII 23–24; the spines increase in length to the third, the rest subequal, the first soft ray much higher than the last spine, the soft fin rounded, the highest rays more than half the length of the head. A. III 19–21, rounded, rather higher than soft dorsal. Pectorals rounded, rather longer than ventrals, which extend to anal. Caudal slightly emarginate. Sc. 100 $^{13\text{–}15}_{34\text{–}36}$. Lateral line with a long curve, becoming straight above middle of anal. Brown, pectorals and caudal white.

Total length 35 millim.

Surface of open sea between New Guinea and Japan.

Lirus perciformis.

Coryphæna perciformis, Mitchill, Am. Month. Mag. ii 1818, p. 244.
Palinurichthys perciformis, Gill, Proc. Ac. Philad. 1860, p. 20.
Pammelas perciformis, Gunther, Cat. ii. p. 485 (1860).
(Further synonymy given in Jordan & Evermann, Fishes N. Am. i. p. 964.)

Depth of body 2½ times in total length, length of head 3 to 3⅓ times. Snout as long as the eye, the diameter of which is 4 to 4¾ times in length of head; interorbital width 2½ times in length of head. Maxilla extends to below anterior quarter of eye. Caudal peduncle 1⅙ times as long as deep. D. VIII 19–21; the spines increase in length to the fourth, the others subequal, the first soft ray much higher than the last spine, the soft fin rounded. A. III 16–18, rounded. Pectorals a little longer than ventrals, about ⅝ length of head. Sc. 80–90 $^{12\text{–}14}_{28\text{–}30}$. Lateral line with a long curve, becoming straight below posterior dorsal rays. Greenish brown, fins dark.

Total length 240 millim.

North Atlantic.

Lirus porosus.

Diagramma porosa, Richards. Ereb. & Terr., Fish. p. 26, figs. 5, 6 (1845)
Hyperoglyphe porosa, Gunther, Cat. i. p. 337 (1859).
Lirus porosus, Gunther, 'Challenger' Pelagic Fishes, p. 11 (1888).

Depth of body 2½ times in total length, length of head 3 to 3¼ times. Snout as long as eye, the diameter of which is 4 times in length of head (3 times in very young specimens). Interorbital width 3 times in length of head. Maxilla nearly reaches to below middle of eye. Caudal peduncle 1¼ times as long as deep. D. IX 20, the spines increasing in length to the fourth, decreasing from the sixth to the eighth, the ninth longer than the seventh; soft fin higher than the spinous, the soft rays decreasing in length from the third. A. III 16; longest rays of dorsal and anal not much more than ⅓ length of head. Ventrals nearly as long as pectorals, which are ⅔ length of head. Caudal emarginate. Sc. 90–100 $^{14}_{30}$. Lateral line with a long curve, becoming straight below the posterior dorsal rays. Greenish brown above and on sides, silvery below; two or three series of darker spots on soft dorsal.

Total length 140 millim.

Coasts of Australia; Kermadec Islands.

STROMATEUS.

Stromateus, Artedi, Gen. p. 19 (1738); Cuv. & Val. ix. p. 372 (1833).
Seserinus, Cuv. & Val. *t. c.* p. 416

Body ovate, compressed, covered with very small scales; mouth small; premaxillaries not protractile; maxillary exposed; no teeth on the palate; opercular bones entire or minutely denticulated; gill-membranes united, free from the isthmus; gill-rakers of moderate length; pseudobranchiæ present; six branchiostegals. A single dorsal fin, with III–IX 40–48 rays, the spines feeble, graduating. Anal long, with III 32–40 rays. Pectorals with 22 rays. Ventrals thoracic, absent in the adult, the pelvis not projecting as a spine. Caudal forked. 46 vertebræ.

Synopsis of the Species.

A. Caudal lobes elongate, much longer than the head. 1. *S. fiatola.*
B. Caudal lobes about as long as the head.
 Depth of body about twice in total length. …… 2. *S. microchirus.*
 Depth of body about 2½ times in total length …. 3. *S. maculatus.*

Stromateus fiatola.

Stromateus fiatola, Linn. Syst. Nat. i. p. 432 (1766).
Chrysostromus fiatoloides, Lacep. iv. p. 697 (1802).

Depth of body 2 to 2⅓ times in total length, length of head about 4 times. Snout longer than the eye, the diameter of which is 5 to 8 times in the length of head, interorbital width about 2½ times. Maxillary not extending to below the eye. D. V–VI 38–40, rays increasing in length to the twelfth, which is about ¾ the length of head, thence decreasing, the last 10 to 15 rays subequal, ¼ to ⅙ the length of head. A. III 30–33. Pectorals nearly as long as the head. Caudal deeply forked, the lobes ⅓ of the depth of body. Gill-rakers about half as long as the eye-diameter, 10 to 12 on the lower part of the anterior arch. Dark purple on back and sides, silvery below; two or three rows of rounded dark blue spots above the lateral line and irregular longitudinal bands below it; inner surface of pectoral and tips of caudal lobes black.

Total length 340 millim.

Mediterranean. S. Africa.

Stromateus microchirus.

Seserinus microchirus, Cuv. & Val. ix. p. 416 (1833).
Stromateus microchirus, Bonap. Faun. Ital., Pesc., with plate (1834).

Depth of body twice in total length, length of head 4 times. Snout longer than the eye, the diameter of which is 5½ times in the length of head, interorbital width 2¼ times. Maxillary not extending to below the eye. D. 45–50, the rays increasing in length to the thirteenth, which is ⅗ the length of head, thence decreasing to the last. A. 35–37. Pectorals ¾ the length of head. Caudal forked, the lobes as long as the head. Gill-rakers about ⅓ as long as the eye, 11 or 12 on the lower part of the anterior arch. Grey, fins darker; eight or nine blackish vertical bands on the sides.

Total length 125 millim.

Mediterranean, S. Africa.

Stromateus maculatus.

Stromateus maculatus, Cuv. & Val. ix. p. 399 (1833).

Depth of body 2½ times in total length, length of head 4¼ times. Snout longer than the eye, the diameter of which is 5 times in the length of head, interorbital width 3 times. Maxillary not extending to below the eye. D. VII 40–43, the rays increasing in length to the tenth soft ray, which is half the length of head. A. III 38. Pectorals longer than the head. Caudal lobes as long as the head. Gill-rakers less than ⅓ the eye-diameter, 12 on the lower part of the anterior arch. Blue above, silvery below; numerous round dark spots on the upper half of the body.

Total length 200 millim.

Pacific coast of S. America.

PEPRILUS.

Rhombus, Lacep. ii p. 321 (1800); Cuv. & Val. ix. p. 401 (1833).
Peprilus, Cuv. Règ. An. ii. p. 213 (1829).

This genus differs from *Stromateus* in that the pelvis projects through the skin as a prominent spine and the dorsal and anal fins are preceded by procurrent spines. Vertebræ 30–31. Branchiostegals 6 or 7. Gill-rakers of moderate length or long. Ventrals absent. The name *Rhombus* was proposed considerably before 1800 for a genus of Mollusca, and *Peprilus* must therefore be used for this genus. There appear to be five well-marked species—*P. paru*, *palometa*, *medius*, *simillimus*, and *triacanthus*—which are completely described in Jordan and Evermann, 'Fishes of North America,' vol. i. p. 965.

STROMATEOIDES.

Stromateoides, Bleeker, Verh. Bat. Gen. xxiv. 1852, p. 19.

This genus differs from *Stromateus* in having the gill-membranes broadly united to the isthmus, in the absence of pseudobranchiæ, and in having very short gill-rakers. Branchiostegals 6 or 7. Vertebræ 35 or 36. Pectorals elongate, with 25–27 rays. Ventrals absent.

The subdivision of the genus into two genera—*Stromateoides*, with higher body, elevated vertical fins, and prominent trenchant dorsal and anal spines; and *Chondroplites*, with more oblong body, little elevated dorsal and anal fins, and concealed subcartilaginous dorsal and anal spines—is unnecessary, and seems due to a lack of acquaintance with the species, since the first two supposed differences are non-existent and the third is unimportant, as in *S. cinereus* the spines are concealed in the adult, and although stronger than those of *S. sinensis*, are formed on a similar plan; for in *S sinensis* the spines have the pointed part set at an obtuse angle to the rest, and in *S. cinereus* the terminal part is similarly set at an angle, but is more expanded.

Synopsis of the Species.

Caudal emarginate or moderately forked	1. *S. sinensis.*
Caudal widely forked, the lower lobe longer	2. *S. cinereus.*

Stromateoides sinensis.

Stromateus sinensis, Euphras. Vetensk. Ak. Nya Handl. Stockholm, ix. 1788, p. 53.
Stromateus albus, Cuv. & Val. ix. p. 388 (1833).
Stromateus atous, Cuv. & Val. *t. c.* p. 389.
Stromateoides atokoia, Bleeker, Verh. Bat. Gen. xxiv. 1852, p. 76.

Depth of body 1¼ to 1⅓ times in total length, length of head 3⅔ to 4 times. Snout as long as the eye, the diameter of which is 3⅔ to 4⅘ times in the length of head, interorbital width twice. Maxillary extending to below anterior third of the eye. Caudal peduncle not as long as deep. D. 43–50, the spines feeble, concealed, rays increasing in length to the fifteenth to eighteenth, which is as long as the pectoral and 1¼ times the length of head; thence they become abruptly shorter, the upper edge of the fin being concave, the posterior part rounded. A. 39–42, exactly similar to the dorsal. Caudal emarginate in the young, moderately forked in the adult. Scales small, deciduous. Brownish grey above, silvery below, with numerous small brown dots. Fins silver-grey at the base, blackish in their marginal parts.

Total length 180 millim.

Seas of India, Malaysia, and China.

Stromateoides cinereus.

Stromateus cinereus, Bloch, xii. p. 90, t. 420 (1793).
Stromateus argenteus, Bloch, *t. c.* p. 92, t. 421.
Stromateus griseus, Cuv. & Val. ix. p. 395 (1833).
Stromateus candidus, Cuv. & Val. *t. c.* p. 391.
Stromateus securifer, Cuv. & Val. *t. c.* p. 394.
Stromateus punctatissimus, Schleg. Faun. Japon., Poiss. p. 121, pl. lxv. (1850).
Stromateoides cinereus, Bleeker, Verh. Bat. Gen. xxiv. 1852, p. 75.

Depth of body 1⅓ to 1⅔ times in the total length, length of head 4 to 5 times. Snout as long as the eye, the diameter of which is 4 to 5 times in the length of head, interorbital width 2¼ times. Maxillary almost extending to below middle of eye. Caudal peduncle as long as deep. D. VIII–X 36–47, the spines projecting in the young, concealed in the adult, their free ends expanded, with an anterior and posterior point, the soft rays increasing in length to about the tenth, thence becoming abruptly shorter, the last fifteen to twenty rays short, subequal. A. V–VII 35–46, similar to the soft dorsal, but with the anterior rays more produced, extending to below the middle of the caudal in the young, much shorter in the adult. Pectorals twice as long as the head in the adult. Caudal forked, with long slender lobes, the lower the longer, especially in the young. Scales small, thin, pierced by numerous minute pores. Purplish grey above, silvery below. Fins silver-grey, dotted with black.

Total length 230 millim.

Seas of India, Malaysia, and China.

APPENDIX.

Mr. Boulenger, who has kindly looked over the above paper and examined specimens of the various genera dealt with, was much struck with the fact that the pelvis is in all cases very loosely attached to the pectoral arch, a feature which I had not considered of much importance; and he suggested that I should examine *Tetragonurus*, which has been placed with or near the Atherinidæ. I find that this genus closely resembles *Cubiceps* or *Nomeus*, not only in general appearance, but also in the dentition and the structure of the mouth, and that the œsophagus is very similar to that of *Stromateus*, having on each side a muscular sac studded internally with rather soft papillæ. The last upper pharyngeals extend back as a pair of elongate toothed rods in the roof of the œsophagus. The Tetragonuridæ must certainly be regarded as allied to the Stromateidæ, differing only in the peculiar scales, the shorter soft dorsal and anal, the œsophageal papillæ not toothed, and the pelvis quite separate from the pectoral arch. This suggests that the loose attachment of the pelvis in the Stromateidæ may be a primitive feature, a conclusion strengthened by the fact that they are among the few spiny-rayed fishes known to occur in the Cretaceous, the genera *Platycormus* and *Homosoma* having been referred by Dr. Smith Woodward, apparently with good reason, to this family. The Icosteidæ have been generally regarded as allied to the Stromateidæ; and in *Icosteus*, the only genus I have been able to examine, the pelvic bones do not even approach the pectoral arch, the ventrals being truly abdominal notwithstanding their rather anterior position.

XXIX.—*On the Hymenoptera collected by Mr. W. L. Distant in the Transvaal, South Africa, with Descriptions of supposed new Species.* By Lieut.-Colonel C. T. BINGHAM.

[Continued from vol. ix. p. 353.]

Family **Pompilidæ** (*cont.*).

Genus PSEUDAGENIA, Kohl.

Pseudagenia Rossi, sp. n.

♀. Black, the scape and basal four joints of the flagellum of the antennæ and the femora, tibiæ, and tarsi of all the legs ferruginous, the apical two joints of the tarsi more or less shaded with fuscous; wings brownish hyaline, iridescent in certain lights, with in the fore wing two obscure darker brown bars, one along the basal and subbasal nervures, the other spreading from the radial into third cubital and third discoidal cells. Head wider than the thorax, the clypeus very convex, its anterior margin rounded; antennæ filiform, planted low down just above the base of the clypeus; front very flat; the eyes lateral, reaching down to the base of the mandibles, their inner orbits parallel; vertex broad, lightly convex, passing by a gradual curve into the occiput. Thorax short, the pronotum rounded anteriorly; the mesonotum, scutellum, and postscutellum very convex, the latter two prominent; median segment rounded posteriorly, with a gradual slope to the apex; legs very long and slender, the posterior tibiæ minutely spined. Wings ample, the basal and subbasal nervures in the fore wing not interstitial; the second cubital cell measured on the cubital nervure twice as long as high and longer than the third cubital cell; the second cubital cell receives the first recurrent nervure in the middle, the third cubital cell receives the second recurrent nervure before the middle. Head and thorax very minutely and closely punctured, opaque, the median segment very finely transversely striate. Abdomen subpetiolate, fusiform, very minutely aciculate, but shining.

Length, ♀ 12; exp. 25 millim.

Hab. Durban, Natal (*A. Ross*).

Allied to and resembling *P. commendabilis*, Kohl; but that species has the mandibles, part of the clypeus, scape of the antennæ, and pedicel ferruginous, the wings clear hyaline, also with two bars, and the second cubital cell smaller than the third.

Pseudagenia flavotegulata, sp. n.

♀. Black, the mandibles, clypeus, antennæ, tegulæ of the wings, legs, and abdomen bright ferruginous; the apical three or four joints of the flagellum of the antennæ, the apex of the tarsi, and the extreme base of the abdomen more or less shaded with fuscous black; wings hyaline, with a short narrow dark brown bar extending on either side of the basal nervure in the fore wing, and a second broader bar extending from the base of the marginal cell obliquely into the third discoidal cell. Head flat, transverse; clypeus strongly convex, transversely oval; antennæ filiform, placed immediately above the clypeus; eyes lateral, reaching down to the base of the mandibles, their inner orbits slightly convergent above. Thorax rather massive, the pro- and mesonotum short, the former rounded anteriorly; the scutellum and postscutellum large, prominent, median segment elongate, as long as the rest of the thorax, with a gentle rounded slope to the apex; legs long and slender, posterior tibiæ slightly spinose. Wings ample; fore wing with the second cubital cell receiving the first recurrent nervure in the middle and much smaller than the third cubital cell, which receives the second recurrent nervure before the middle, and is remarkably broad at apex, twice as broad there as at base. Head and thorax finely and closely punctured, opaque and pruinose. Abdomen shorter than the head and thorax united, subpetiolate and fusiform.

Length, ♀ 11; exp. 23 millim.

Hab. Nyasaland (Fort Johnston). Collected by Dr. P. Rendall.

Family Sphegidæ.

Genus Tachytes, Panz.

Tachytes natalensis, Sauss.

Tachytes natalensis, Sauss. Mém. Soc. Phys. et Hist. Nat. Genève, xiv. (1854) pt. i. Mél. Hym. p. 21, pl. i. fig. 4, ♂.

One female, Durban (*Distant*).

Tachytes velox, Smith.

Tachytes velox, Smith, Cat. Hym. B. M. iv. (1856) p. 301, ♂.

One female, one male, Fort Johnston, Nyasaland (*Rendall*).

Tachytes hirsutus, Smith.

Tachytes hirsutus, Smith, Cat. Hym. B. M. iv. (1856) p. 300, ♂.

Three females, three males, Pretoria (*Distant*).

Genus Liris, Fabr.

Liris hæmorrhoidalis, Fabr.

Pompilus hæmorrhoidalis, Fabr. Syst. Piez. 1804, p. 198.
Lyrops Savignyi, Spin. Ann. Soc. Ent. Fr. vii. (1838) p. 476, ♀.
Liris orichalcea, Dhlb. Hym. Eur. (1843) p. 135, ♂.
Liris hæmorrhoidalis, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. (1884) p. 256, ♂ ♀.

Eight females, Pretoria (*Distant*); Fort Johnston, Nyasaland (*Rendall*).

Liris diabolica, Smith.

Larrada diabolica, Smith, Ann. & Mag. Nat. Hist. (4) xii. (1873) p. 294, ♀.
Larra diabolica, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. (1884) p. 243.

Two females, Fort Johnston, Nyasaland (*Rendall*).

Genus Notogonia, Costa.

Notogonia subfasciata, Walker.

Larrada subfasciata, Walker, List Hym. in Egypt, 1871, p. 21.
Larra subfasciata, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. (1884) p. 247.

Five females, one male, Pretoria (*Distant*); Waterberg (*Distant*); Fort Johnston, Nyasaland (*Rendall*).

Genus LARRA, Fabr.

Larra anathema, Rossi.

Sphex anathema, Rossi, Faun. Etrus. ii. (1790) p. 65.
Larra ichneumoniformis, Fabr. Ent. Syst. ii. (1793) p. 221.
Tachytes anathema, Lepel. Hist. Nat. Ins., Hym. iii. (1845) p. 254.
Larra anathema, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. (1884) p. 238, ♀ ♂.

Two females, Barberton, Transvaal, and Fort Johnston, Nyasaland (*Rendall*).

Genus PALARUS, Latr.

Palarus O'Neili, Brauns.

Palarus O'Neili, Brauns, Ann. k. k. naturh. Hofmus. Wien, xiii. (1898) p. 408.

A pair (male and female), Rustenburg (*Distant*).

Genus STIZUS, Latr.

Stizus fenestratus, Smith.

Larra fenestrata, Smith, Cat. Hym. B. M. iv. (1856) p. 342, ♂.
Stizus fenestratus, Handl. Sitzber. Akad. Wiss. Wien, ci. (1892) p. 108, ♀ ♂.

Three females, Fort Johnston, Nyasaland (*Rendall*).

Stizus tenuicornis, Smith.

Larra tenuicornis, Smith, Cat. Hym. B. M. iv. (1856) p. 351.
Stizus tenuicornis, Handl. Sitzber. Akad. Wiss. Wien, ci. (1892) p. 173, ♂.

One female, Pretoria (*Distant*).

Stizus argentifrons?, Smith.

Larra argentifrons, Smith, Cat. Hym. B. M. iv. (1856) p. 330, ♂.
Stizus argentifrons, Handl. Sitzber. Akad. Wiss. Wien, ci. (1892) p. 43, ♂.

One female, Durban (*A. Ross*).

The specimen is in poor condition, so it is with some doubt I refer it to the above species. *S. argentifrons*, Smith, as Handlirsch remarks (*l. c.*), seems to be only a local variety of the Palæarctic *S. tridens*, Fabr.

Genus BEMBEX, Fabr.

Bembex diversipennis, Smith.

Bembex diversipennis, Smith, Ann. & Mag. Nat. Hist. (4) xii. (1873)

p. 207, ♀ ♂; Handl Sitzber. Akad. Wiss. Wien, cii. (1893) p. 714, ♂, pl. i. fig. 5, pl. iii fig. 19, pl. iv. fig. 4, and pl. vi. fig. 3.

Four females, one male, Pretoria (*Distant* and *Zutrzenka*).

Bembex sibilans, Handl.

Bembex sibilans, Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 852, pl. iii. figs. 3 & 27, and pl. vii. fig. 30.

Three females and one male, Pretoria (*Distant*), and Fort Johnston, Nyasaland (*Rendall*).

Bembex undulata, Spin.

Bembex undulata, Spin. Ann. Soc. Ent. Fr. vii. (1838) p. 468; Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 805, ♂.

Five females, two males, Pienaars River (*Distant*); Zomba (*Rendall*).

Bembex olivata, Dhlb.

Bembex olivata, Dhlb. Hym. Eur. i. (1845) p. 491; Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 812, ♀ ♂, pl. ii. fig. 17, and pl. v. fig. 23.

One female, Fort Johnston, Nyasaland (*Rendall*).

Bembex lusca, Spin.

Bembex lusca, Spin. Ann. Soc. Ent. Fr. vii. (1838) p. 467; Gerst. v. d. Decken, Reise in Ost-Afr. 1873, p. 333; Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 802, pl. ii. fig. 13.

Five females, Johannesburg and Waterval-onder (*Ross*).

Bembex ochracea, Handlirsch.

Bembex ochracea, Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 864, ♂, pl. iii. fig. 10.

Three females, one male, Pretoria (*Distant*); Waterval-onder (*Ross*); Durban (*Distant*).

Bembex melanopa, Handlirsch.

Bembex melanopa, Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 797, ♀ ♂, pl. ii. fig. 10, and pl. vii. fig. 7.

Four females and one male, Pretoria (*Distant*); Johannesburg (*Ross*); Fort Johnston, Nyasaland (*Rendall*).

Bembex sulphurescens, Dhlb.

Bembex sulphurescens, Dhlb. Hym. Eur. i. (1845) pp. 180 & 491; Handl. Sitzber. Akad. Wiss. Wien, cii. (1893) p. 897, pl. ii. fig. 3.

One female, one male, Fort Johnston, Nyasaland (*Rendall*). Indistinguishable from Indian specimens.

Genus GORYTES, Latr.

Gorytes natalensis, Smith.

Gorytes natalensis, Smith, Cat. Hym. B. M. iv. (1856) p. 365, ♀, pl. xi. fig. 3; Handl. Sitzber. Akad. Wiss. Wien, xcvii. (1888) p. 515, ♀.
Lestiphorus africanus, Radosk. Jorn. Acad. Sc. math. Lisb. viii. (1881) p. 207, ♀.

One female, Durban (*A. Ross*).

Genus NYSSON, Latr.

Nysson abdominalis, Guér.

Nysson (*Paranysson*) *abdominalis*, Guér. Icon. Règn. anim. vii. (1845) p. 441.
Nysson abdominalis, Gerst. Abh. Naturf. Ges. Halle, x. (1866) p. 122; Handl. Sitzber. Akad. Wiss. Wien, xcv. (1887) p. 318.

Five females and four males, Pretoria (*Distant*).

Genus PHILANTHUS, Fabr.

Philanthus triangulum, Fabr., var. *diadema*, Fabr.

Crabro diadema, Fabr. Spec. Ins. i. (1781) p. 471.
Philanthus diadema, Fabr. Skrivt. naturh. Selsk. Copenhagen, i. pt. i. (1790) pp. 27 & 225; id. Ent. Syst. ii. (1793) p. 289; Latr. Gen. Crust. et Ins. iv. (1809) p. 95; Dhlb. Hym. Eur. i. (1845) p. 495; Smith, Cat. Hym. B. M. iv. (1856) p. 471.
Philanthus triangulum, var. *diadema*, Girard, Traité Elém. d'Ent. ii. 1879, p. 928; Grib. Mem. Ins. Bolog. (5) iv. (1895) p. 129.

Five females, three males, Pretoria (*Distant*); Durban (*Ross*); Brak Kloof, Cape Colony (*Mrs. White*); Fort Johnston, Nyasaland (*Rendall*).

Philanthus innominatus, sp. n.

♀. Mandibles black, punctured, shining red in the middle, with a yellow spot at base above; clypeus, the sides of the face, a crescentic mark between the base of the antennæ, a spot on the back of the scape at apex, and a spot on the cheeks behind the eyes lemon-yellow, the rest of the head and of the antennæ black; eyes reaching the base of the mandibles, the inner orbits emarginate above the base of the antennæ; clypeus, sides of the face below the base of the antennæ, and the cheeks behind the eyes smooth, very sparsely punctured, the rest of the head densely and somewhat coarsely punctured and opaque. Thorax black, a line interrupted in the middle on the pronotum, the anterior half of the tegulæ, a large spot on the flanks beneath the base of the wings, and an elongate lunate spot on the postscutellum yellow; the whole thorax except the portions marked with yellow and the basal half of the median segment closely finely punctured, the basal half of the median segment highly polished and shining, with a deep, oval, short and broad, depressed median longitudinal hollow at the apex of the polished portion, this hollow transversely punctured inside. Wings fusco-hyaline, pubescent, nervures brown. Legs black, the tarsi reddish towards the apex; the apex of the trochanters, a spot on the anterior and intermediate femora at apex, and a broadish line on the anterior and intermediate tibiæ yellow. Abdomen orange-yellow, shining, the basal half of the first segment black, the third and fourth segments shaded with fuscous above

Length, ♀, 19 millim.

Hab. Pretoria. Collected by Mr. Distant.

This species seems closest to *Philanthus Lœflingii*, Dhlb., but differs both in sculpture and colour.

Philanthus fuscipennis, Guér.

Philanthus fuscipennis, Guér. Iconogr. Règn. anim. vii., Ins. (1845) p. 443; Smith, Cat. Hym. B. M. iv. (1856) p. 472.

Three females, Pretoria (*Distant*); Johannesburg and Durban (*A. Ross*).

Philanthus bucephalus, Smith.

Philanthus bucephalus, Smith, Cat. Hym. B. M. iv. (1856) p. 472.

Five males, Pretoria (*Distant*); Barberton (*Rendall*); Brak Kloof (*Mrs. White*).

I was at first inclined to think that this species was only a light-coloured exceptionally large-headed male of *P. fuscipennis*, Guérin (Smith's type is a male); but I have lately seen an undoubted female of what can be nothing else than *P. bucephalus*. This latter species has cheeks twice as broad as those of *P. fuscipennis.*

Philanthus histrio, Fabr.

Philanthus histrio, Fabr. Syst. Piez. 1804, p. 301.
Philanthus Schonherri, Dhlb. Hym. Eur. i. (1845) p. 496.
Philanthus formosus, Smith, Cat. Hym. B. M. iv. (1856) p. 471.

Two males (typical), Johannesburg (*Cregoe*); two females and two males (var. *formosus*), Johannesburg and Durban (*A. Ross*).

Genus Cerceris, Latr.

Cerceris nasuta, Lepel.

Cerceris nasuta, Lep. Hist. Nat. Ins., Hym. iii. (1815) p 6; Lucas, Expl. sc. Algérie, Zool. iii. (1846) p. 250, pl. xii. fig. 8; André, Spec. Hym. Eur. iii. (1800) p. 335, ♀.

One female, Durban (*Distant*).

Indistinguishable from Algerian specimens.

Cerceris latifrons, sp. n.

♀. Black, the mandibles, the antennæ beneath, and the femora, tibiæ, and tarsi of the legs red; the third abdominal segment above and a narrow line on each side of the apical margin of the fourth segment yellow, the yellow on the third segment emarginate anteriorly. Head, thorax, and basal two abdominal segments coarsely, closely, cribrately punctured, the fourth and following abdominal segments with large, shallow, scattered punctures. Head, thorax, and abdomen pubescent, the pubescence pale yellowish white and most dense on the front below the antennæ and the clypeus, entirely hiding the sculpture. Mandibles shining, covered with scattered short hairs; clypeus slightly convex, deeply emarginate anteriorly, front flat, remarkably broad, as broad across at base of mandibles as high; eyes oval, rather small, their inner margins parallel; head above and cheeks behind the eyes broad and flat, the latter sharply truncate posteriorly. Thorax massive, the mesonotum twice as broad as long; the median segment convex, the cordiform area at its base obscurely obliquely striate. Wings fusco-hyaline, nervures brownish black. Abdomen with the basal segment forming a narrow rectangular pedicel about a third as wide as the second segment; beneath the pedicel is briefly carinate at base and with a tubercle on each side at the margin; pygidium oblong, finely rugulose, the sides, but not the apex, margined.

Length, ♀, 14 millim.

Hab. Procured on the Natal border of the Transvaal.

Cerceris orientalis, Smith.

Cerceris orientalis, Smith, Cat. Hym. B. M. iv. (1856) p. 454, ♀ ♂.

One female, Fort Johnston, Nyasaland (*Rendall*).

Identical with specimens from Kurachi in Western India.

Cerceris fulviventris, Guérin.

Cerceris fulviventris, Guér. Iconogr. Règn. anim., Ins. vii. (1845) p. 444.

One female (typical), Delagoa Bay (*Distant*); one female (var.?), Fort Johnston, Nyasaland (*Rendall*).

The latter has the abdomen bright yellow, not fulvous, and the wings a deeper fuscous brown, but otherwise in shape and sculpture it agrees with Guérin's brief description.

Cerceris mitrata, sp. n.

♂. Clypeus and front to a little above the base of the antennæ and the abdomen bright chrome-yellow; mandibles, antennæ, the posterior half of the vertex, the occiput and upper half of the cheeks, the posterior half of the pronotum, the scutellum and postscutellum, an irregular mark on each side of the median segment at base with a round detached spot on the inner side of it, and the femora, tibiæ, and tarsi of the legs red, the red on the head and thorax dark, on the legs slightly yellowish; the rest of the head and thorax black, the wings fulvous yellow, the apex and apical margin fuscous, the tegulæ fulvous red, the extreme base of the abdomen black. The head, thorax, and abdomen coarsely punctured, the punctures on the head and thorax dense, those on the abdomen more sparse and scattered. The front of the head below the antennæ and clypeus covered with a fairly abundant beautiful golden pubescence hiding the sculpture. Clypeus strongly convex in the middle, the sides anteriorly emarginate, the lateral angle laminate and produced, the head above and the cheeks broad, the occiput and the cheeks posteriorly sharply truncate. Thorax narrower than the head; the scutellum and postscutellum raised gibbous, the median segment convex, the cordiform space at base with divergent oblique striæ from a medial impressed line. Abdomen with the basal segment narrowed, forming a pedicel, which is convex above and twice as broad as long; pygidial area flat, margined at the sides, covered with coarse shallow punctures; hypopygium convex, with an apical short spine on each side.

Length, ♂, 10 millim.

Hab. Collected at Middleburg (*Distant*), and one male at Johannesburg (*Ross*).

Genus Sphex, Linn. (sensu lat. apud Kohl).

Sphex xanthocerus, Illig.

Sphex xanthocerus, Illig. Mag. f. Ins. i. (1801) p. 193.
Chlorion mandibulare, Fabr. Syst. Piez. 1804, p. 218.
Pronæus æneus, Latr. Gen. Crust. et Ins. iv. (1809) p. 56.
Pronæus rufipes, Guér. Voy. Abyss. vi. pt. 4 (1848), p. 357.
Pronæus instabilis, Smith, Cat. Hym. B. M. iv. (1856) p. 240.
Chlorion fulvipes, Tasch. Zeits. f. d. ges. Naturw. liii. (1880) p. 482.

Four females and four males, Zomba and Fort Johnston, Nyasaland (*Rendall*).

Sphex Boehmanni, Dhlb.

Sphex Boehmanni, Dahlb. Hym. Eur. i. (1845) p. 436, ♂, Kohl, Ann. Naturh. Hofmus. Wien, x. (1895) p. 52, pl. iv. figs. 5-7, ♂.

Nine females, seven males, Pretoria (*Distant*); Barberton (*Rendall*); Rustenburg (*Distant*); Durban (*Ross*).

Sphex tyrannus, Smith.

Harpactopus tyrannus, Smith, Cat. Hym. B. M. iv. (1856) p. 264, ♀.
Sphex tyrannus, Kohl, Ann. Naturh. Hofmus. Wien, v. (1890) p. 349, ♀ ♂.

Two females, four males, Fort Johnston, Nyasaland (*Rendall*).

Sphex nigripes, Smith.

Sphex nigripes, Smith, Cat. Hym. B. M. iv. (1856) p. 254, ♀.
Sphex siamensis, Taschenb. Zeits. f. d. ges. Naturwiss. Halle, xxxiv. (1869) p. 413, ♀, var.
Sphex pulchripennis, Mocs. Magy. Akad. Term. Ertek. xiii. (1883) p. 11, ♀, var.
Sphex erythropoda, Cam. Mem. & Proc. Manch. Lit. & Phil. Soc. ser. 4, ii. (1889) p. 20, ♀.

Five females (var. *pulchripennis*), Pretoria (*Distant*); two females, five males (var. *muticus*, Kohl), Pretoria (*Distant*); Fort Johnston, Nyasaland (*Rendall*).

Sphex niveatus, Dufour.

Sphex niveata, Duf. Ann. Soc. Ent. Fr. sér. 3, i. (1863) p. 377, ♂.
Enodia albopectinata, Taschb. Zeits. f. d. ges. Naturwiss. Halle, xxxiv. (1869) p. 410, ♀.
Sphex niveatus, Kohl, Termesz. Fuzetek, ix. (1885) p. 182, ♀ ♂; André, Spec. Hym. Eur. iii. (1888) fasc. xxvii. p. 128, ♀ ♂.

Two females, five males, Pretoria (*Distant*); Natal border, Transvaal; Fort Johnston, Nyasaland (*Rendall*); Brak Kloof, Cape Colony (*Mrs. White*).

Sphex pelopœiformis, Dhlb.

Sphex pelopœiformis, Dhlb. Hym. Eur. i. (1845) p. 437; Smith, Cat. Hym. B. M. iv. (1856) p. 246, ♀ ♂, Kohl, Termesz. Fuzetek, ix. (1885) p. 193, ♂.
Sphex longiventris, Sauss. Reise Novara, Bd. ii. (1867), Hym. p. 37, pl. ii. fig. 21, Grib. Ann. Mus. Civ. Gen. xxi. (1884) p. 300, ♀ ♂.

A solitary male, Pretoria (*Distant*).

Sphex umbrosus, Christ.

Sphex umbrosa, Christ, Naturg. Ins. 1791, p. 293, pl. xix. fig. 2, ♀.
Sphex rufipennis, *albifrons*, et *unicolor*, Fabr. Ent. Syst. ii. (1793) pp. 201, 207, & 208.

Sphex argentata, Dhlb. Hym. Eur. i. (1845) p. 25.
Sphex argentifrons, Lepel. Hist. Nat. Ins., Hym. iii. (1845) p. 337.
Sphex lanatus, Mocs. Magy. Akad. Term. Ertek. xiii. (1883) p. 34, ♂, var.
Sphex umbrosus, Kohl, Ann. Naturh. Hofmus. Wien, v. (1890) p. 406.

Two females, two males (var. *lanatus*, Mocs.), Pretoria (*Distant*); Waterberg (*Wildes*); two females (typical), Fort Johnston, Nyasaland (*Rendall*).

Genus AMPULEX, Jurine.

Ampulex compressa, Fabr.

Sphex compressa, Fabr. Spec. Ins. i. (1781) p. 445.
Chlorion compressum, Fabr. Syst. Piez. 1804, p. 219.
Ampulex compressa, Jur. Nouv. Méth. class. Hym. 1807, p 134, ♀ ♂; Smith, Cat. Hym. B. M. iv. (1856) p. 268; Kohl, Ann. Naturh. Hofmus. Wien, viii. (1893) pp. 473, 483, & 491, pl. xi. figs. 11 & 22, and pl. xiii. fig. 71.
Ampulex sinensis, Sauss. Reise Novara, Zool. ii. pt. i. (1867), Hym. p. 325, pl. ii. fig. 25.

Two females, Pemba Island (*Mrs. Burtt*).

Ampulex nigrocærulea, Sauss.

Ampulex nigrocærulea, Sauss. Dist. Nat. Transv. 1892, p. 212, ♀, pl. iv. fig. 6; Kohl, Ann. Naturh. Hofmus. Wien, viii. (1893) p. 497, ♀.

One female, Pretoria.

Genus SCELIPHRON, Klug.

Sceliphron spirifex, Linn.

Sphex spirifex, Linn. Syst. Nat. i. (1758) p. 570.
Sceliphron spirifex, Klug, Neu. Schrift. Ges. naturf. Fr. Berl. iii (1801) p. 564.
Pelopoeus spirifex, Latr. Hist. Nat. Crust. et Ins. xiii. (1805) p. 295.

Nine females, ten males, Pretoria (*Distant*); Zomba and Fort Johnston, Nyasaland (*Rendall*); Beaufort West, Cape Colony (*Cregoe*).

Sceliphron Spinolæ, Lepel.

Pelopoeus Spinolæ, Lepel. Hist. Nat. Ins., Hym. iii. (1845) p. 307, ♀ ♂.
Pelopoeus Eckloni, Dhlb. Hym. Eur. i. (1845) p. 434.
Sceliphron Spinolæ, Sauss. Grandid. Hist. Madag. xx. pt. i. (1892) p. 440, ♀ ♂.

Three females, Pretoria (*Distant*); Barberton (*Rendall*).

Sceliphron violaceum, Fabr.

Sphex violacea, Fabr. Syst. Ent. 1775, p. 346.
Pepsis violaceus, Fabr. Syst. Piez. 1804, p. 211.

Pelopoeus violaceus, Ach. Costa, Ann. Mus. Zool. Napoli, iv. (1867) p. 76, ♀ ♂.
Sceliphron violaceum, Dalla Torre, Cat. Hym. vii. (1897) p. 392.

One male, Barberton (*Rendall*).

Genus AMMOPHILA, Kirby.

Ammophila ludovicus, Smith.

Ammophila ludovicus, Smith, Cat. Hym. B. M. iv. (1856) p. 212, ♀.

Two females, one male, Pretoria (*Distant*).

Ammophila bonæspei, Lepel.

Ammophila bonæspei, Lepel. Hist. Nat. Ins., Hym. iii. (1845) p. 382, ♀ ♂ ; Lucas, Expl. sc. Algér., Zool. iii. (1846) p. 276.

Eight males, Pretoria (*Distant*) ; Durban (*A. Ross*).

Ammophila ferrugineipes, Lepel.

Ammophila ferrugineipes, Lepel. Hist. Nat. Ins., Hym. iii. (1845) p. 383, ♀ ; Smith, Cat. Hym. B. M. iv. (1856) p. 212 ; Gribodo, Ann. Mus. Civ. Gen. xxi. (1884) p. 297, ♀.

Five females, nine males, Pretoria (*Distant*) ; Fort Johnston, Nyasaland (*Rendall*).

Ammophila beniniensis, Pal. Beauv.

Sphex beniniensis, Pal. Beauv. Ins. rec. Afr. et Amér. (1811) p. 48, Hym. pl. vii. fig. 1.
Ammophila beniniensis, Smith, Cat. Hym. B. M. iv. (1856) p. 213.

Five females, two males, Pretoria (*Distant*) ; Durban (*A. Ross*) ; Delagoa Bay (*Distant*) ; Fort Johnston, Nyasaland (*Rendall*).

Genus TRYPOXYLON, Latr.

Trypoxylon confrater, Kohl.

Trypoxylon confrater, Kohl, Ann. Naturh. Hofmus. Wien, ix. (1894) p. 292, ♀, pl. xiii. fig. 11, and pl. xvi. figs. 109 & 110.

A single female from Fort Johnston, Nyasaland (*Rendall*).

Tribe DIPLOPTERA.

Family **Eumenidæ.**

Genus DISCOELIUS, Latr.

Discoelius transvaalensis, sp. n.

♀. Black, pubescent, the mandibles, apical half of the clypeus, the greater portion of the cheeks behind the eyes, the scape, the basal joint and basal half of the second joint of the flagellum of the antennæ, the prothorax and legs, the pedicel underneath and on the sides, and the apical two abdominal segments deep maroon-red; wings fusco-hyaline, nervures brown, tegulæ red. The head, thorax, and abdomen covered with a soft, white, rather long, semierect pubescence, most dense on the median segment. Head and thorax closely and somewhat coarsely punctured, opaque; pedicel and abdomen more finely but yet closely punctured, shining.

Length, ♀, 18; exp. 38 millim.

Male unknown.

Hab. Collected by Herr Zutrzenka at Leydenburg, East Transvaal.

This is a true *Discoelius*, with four joints in the labial palpi and the recurrent nervures in the fore wing both received in the second cubital cell, this latter with a distinct border at the marginal cell.

Genus EUMENES.

Eumenes maxillosa, Degeer.

Vespa maxillosa, Degeer, Mém. Hist. Ins. iii. (1773) p. 577, pl xxix. figs 1 & 2.
Sphex tinctor, Christ, Naturg. d. Ins. 1791, p. 311, pl. xxvi fig. 1.
Eumenes Savignyi, Guér. Icon. Règn. anim. vii. (1845) p. 446, pl lxvii. fig. 4.
Eumenes tinctor, Sauss Etud Fam Vesp. i, *Eumenes* (1852), p 49; Smith, Cat Hym B. M. v. (1857) p. 27.
Eumenes maxillosus, Sauss Grandid. Hist. Madag. xx. pt. i. (1891) p. 153.

Thirty-one females, Pretoria (*Distant*); Fort Johnston, Nyasaland, and Barberton (*Rendall*); Durban (*Ross*).

Nine males, Pretoria (*Distant*); Fort Johnston, Nyasaland (*Rendall*).

Eumenes caffra, Linn.

Vespa caffra, Linn. Syst. Nat. 12th ed. (1767) p. 951; Christ, Naturg. d. Ins. 1791, p. 2140.
Vespa cratiata, Weber, Obs. Ent. 1801, p. 101.
Eumenes caffra, Sauss. Etud. Fam. Vesp. i., *Eum.* (1852) p. 45.

Three females, two males (typical), Pretoria (*Distant*).

Eumenes Lepeletieri, Sauss.

Eumenes Lepeletierii, Sauss. Etud. Fam. Vesp. i., *Eum.* (1852) p. 45, ♀, pl. x. fig. 1; Gerst. v. d. Decken, Reise in Ost-Afr. 1873, p. 322; André, Spec. Hym. Eur. ii. (1884) p. 682; Grib. Ann. Mus Civ. Gen. xxi. (1884) p. 292; Magretti, Ann. Mus. Civ. Gen. xxi. (1884) p. 611.

Seven females, one male, Pretoria (*Distant*); Johannesburg (*A. Ross*); Middleburg (*Distant*); Durban (*A. Ross*).

This species is very distinct, but at first sight is apt to be mistaken for *E. caffra*; the base of the abdomen (excluding the pedicel) is in this species always red, in *E. caffra* always black.

Eumenes Rendalli, sp. n.

♀. Allied to and resembling *E. Edwardsi*, Sauss., in shape and *E. fenestralis*, Sauss., a little in colour. Dull brick-red; the clypeus, a triangular mark on the front, and the antennæ orange-red, the flagellum shaded above towards the apex with black; vertex black; the mesonotum, a broad vertical line on the median segment, and the sutures on the flanks and above on the thorax black; legs pale red. Wings hyaline, shaded with fulvous along the costal margin and with the apical two thirds of the marginal cell in the fore wing dark fuscous. Pedicel and abdomen red, the former with a black mark above towards the apex, the latter with the basal half of the first segment red, the apical half black, the second and following segments black above, red below, with their posterior margins broadly yellow. The head above the base of the antennæ, the thorax, and the median segment very finely and closely punctured; the clypeus, pedicel, and abdomen smooth, but not polished or shining.

♂. Similar; the clypeus, a narrow line behind the eyes, and a broader streak along the lower portion of the emargination of the eyes bright yellow. The yellow on the apical abdominal segments replaced with red.

Length*, ♀, 17; exp. 32 millim. ♂, 13; exp. 26 millim.

Hab. Described from five females and one male from Fort Johnston, Nyasaland (collected by Dr. Rendall), and one female from Barberton, Transvaal.

Eumenes Lucasia, Sauss.

Eumenes Lucasia, Sauss. Etud. Fam. Vesp., i. *Eumen.* (1852) p. 68.
Zethus favillaceus, Walk. List Hym. Egypt, 1871, p. 28.

A solitary specimen of this apparently widespread species from Pretoria (*Distant*).

---

* In the Diploptera the measurement of the length is taken only to the apex of the second abdominal segment.

Genus RHYNCHIUM, Spinola.

Rhynchium synagroides, Sauss.

Rhynchium synagroides, Sauss. Etud. Fam. Vesp. i., *Eumen.* (1852) p. 103, pl. xiv. fig. 2, ♂.

Three males, Johannesburg (*A. Ross*); Barberton (*Rendall*).

Rhynchium cyanopterum, Sauss.

Rhygium cyanopterum, Sauss. Etud. Fam. Vesp. i., *Eumen.* (1858) p. 108, ♀ ♂.
Rhynchium cyanopterum, André, Spec. Hym. Eur. ii. (1884) p. 649, ♀ ♂; Mayr, Ann. Mus. Civ. Gen. xxi. (1884) p. 618; Sauss. Grandidier, Hist. Madag. xx. pt. i. (1891) p. 159.

Nine females, two males, Pretoria and Rustenburg (*Distant*); Fort Johnston and Zomba, Nyasaland (*Rendall*).

Rhynchium fallax, Sauss.

Rhynchium fallax, Sauss. Etude Fam. Vesp. iii, *Masar.* (1856) p. 175, ♀

Thirteen females, Fort Johnston, Nyasaland (*Rendall*).

Genus ODYNERUS, Latr.

Odynerus punctatipennis, Sauss.

Odynerus (*Leionotus*) *punctatipennis*, Sauss. Etud. Fam. Vesp. i., *Eumen.* (1852) p. 210, ♀.

Two females and one male, Fort Johnston, Nyasaland (*Rendall*); Durban (*A. Ross*).
Absolutely inseparable from Indian specimens.

Odynerus carinulatus, Sauss.

Odynerus (*Hypodynerus*) *carinulatus*, Sauss. Etud. Fam. Vesp. iii, *Masar.* (1856) p. 259, pl. xiv. fig. 3.

Four females and one male, Pretoria (*Distant*); Johannesburg (*A. Ross*).

Odynerus capensis, Sauss.

Odynerus (*Ancistrocerus*) *capensis*, Sauss. Etud. Fam. Vesp. iii., *Masar.* (1856) p. 214.

One female and one male, Pretoria (*Distant*).

Odynerus rubroniger, sp. n.

♀. Dull red, the upper margin of the clypeus, the flagellum of the antennæ, the front (except a spot between the base of the antennæ and a spot in the emargination of the eyes), the vertex and cheeks (except an elongate spot on the latter), the lower portion of the thorax, the mesonotum, the margins all round of the scutellum and postscutellum, a broad line down the middle of the median segment, a large oval spot at the base of the first abdominal segment above, the base and two comma-shaped marks on the disk of the second abdominal segment, and the apical four segments entirely black; wings dark fuscous; the coxæ, trochanters, and base of the femora of the legs black. The head, thorax, and abdomen closely cribrately punctured; the mandibles long and pointed, with broad teeth on the inner margin; clypeus circular, bidentate anteriorly; prothorax truncate anteriorly; postscutellum strongly bituberculate; tegulæ very large, median segment with sharp lateral margins not rounded.

Length, ♀, 12; exp. 26 millim.

Hab. A single specimen procured by Mr. Distant at Pretoria.

Belongs to the subgenus *Pterochilus*, Herrich-Schäffer.

Odynerus simplex, sp. n.

♂. Allied to and resembling *O. silaos*, Sauss., but much larger and somewhat differently coloured. Black, the clypeus, a broad line on the scape of the antennæ in front, and the posterior margins of the basal two abdominal segments above pale yellowish white; the femora, tibiæ, and tarsi of the legs ferruginous. Head, thorax, and base of the abdomen closely cribrately punctured and covered with abundant soft white, rather long pubescence, the rest of the abdomen very smooth and shining, non-pubescent, and very finely and sparsely punctured. Wings hyaline, fulvous brown along the costal margin. Abdomen beneath with a deep broad furrow between the first and second segments, the anterior margin of the latter tuberculate or dentate in the middle.

Length, ♂, 13; exp. 28 millim.

Hab. One specimen procured at Pretoria (*Distant*).

The antennæ in this specimen are curled at the apex, as in the subgenus *Hoplopus*, Wesmael.

[To be continued.]

XXX.—*On new Species of* Histeridæ *and Notices of others.*

By G. LEWIS, F.L.S.

THIS paper is the twenty-first of a series on the Histeridæ published in this Magazine. In it I have established two new genera, which I think will facilitate the study of the *Tryponæi*, and it is probable before very long it may be desirable to add to this number, for the species hitherto included in *Tryponæus* are extremely numerous, but at present there is some difficulty in dealing with many undescribed species owing to the uncertainty of it being possible to assign the sexes correctly to each other. There are about fifteen undescribed species in my possession, and I believe that in Herr J. Schmidt's collection there are as many again.

List of Species and New Genera.

Apobletes prostratus.
— — feriatus
—— rubrofemoratus.
—— Foersterii
Platysoma scalptum.
—— Thugnaum.
—— vicinale.
—— obliquum.
Eblisia Nairii.
—— pagana.
—— infans.
Megalocraerus, gen. nov.
—— rubricatus.
Pachycraerus prasinus.
—— ellipsoides.
Stenotrophis, gen. nov.
Exosternus, gen. nov
—— manicatus.
—— æratus.
Phelister conquisitus.
—— foveicollis.
—— hospes.
Omalodes foveipennis.
Hister boleti, *Lew.*
Hister mundulus.
—— tetricus.
Eretmotus major.
—— sinuaticollis.
—— cæsariensis.
Notodoma saturum.
—— globatum, *Mars.*
—— nigrum.
Phoxonotus lectus.
—— Fryi, *Lew.*
Reninus turritus.
Tryponæus cornifrons.
—— bellator.
Coptostathus, gen. nov.
Xylonæus, gen. nov.
—— immarginatus.
Trypeticus Grouvellei, *Mars.*
Teretriosoma festivum, *Lew.*
—— prasinum.
Teretrius pilimanus, *Mars*
—— Marshallii.
—— 4-striatus.
—— indus.
—— distinctus.

Apobletes prostratus, sp. n.

Oblongo-ovatus, depressus, piceus, nitidus; fronte punctulata, stria supra oculos valida, ad angulos interrupta; elytris striis 1-3 integris (3 aliquando interrupta), 4 apicali; mesosterno bisinuato marginatoque.

L. 3½ mill.

Oblong-oval, depressed, piceous and shining; the head evenly and not closely punctulate, and somewhat concave anteriorly, stria strong over the eyes and interrupted at the angle and widely sinuous anteriorly; the thorax finely punctulate laterally, with the marginal stria interrupted behind the neck; the elytra, 1–3 dorsal striæ complete, with a short apical appendage representing the fourth, sometimes the third is evanescent in the middle; the propygidium is almost smooth in the middle and sparingly pointed at the sides; the pygidium is evenly and rather coarsely punctured, with two shallow basal foveæ; the prosternum is very finely and sparingly punctulate; the mesosternum is marginate, but owing to the stria being very fine and close to the edge (which is impressed behind the prosternal keel) it is not easy to see except under a microscope.

This species is relatively broader than *A. marginicollis*, Lew., and the head is not opaque. Except in size it is most similar to *A. tener*, Mars.

Hab. Dutch Timor and Solor Island (*Doherty*). Twenty examples.

Apobletes feriatus, sp. n.

Oblongus, planatus, niger, nitidus; antennis pedibusque rufo-brunneis; fronte parum dense punctulata, stria utrinque distincte interrupta; elytris striis 1–2 integris, 3 interrupta vel in medio evanescenti; pygidio distincte punctato, utrinque foveolato; tibiis anticis 4-dentatis.

L. 3½ mill.

Oblong, flat, rather parallel at the sides, black and shining; antennæ and legs reddish brown; the head and mandibles somewhat densely punctulate, forehead concave in the region of the stria, which is distinctly interrupted on either side; the thorax finely punctulate on the lateral borders, marginal stria interrupted behind the neck; the elytra, striæ lightly impressed, 1–2 complete, 3 sometimes interrupted in the middle, sometimes traceable as complete; the propygidium is sparingly and very finely punctured, except at the impressions on either side of the base, where the punctures are more conspicuous; the pygidium is distinctly pointed and has two shallow foveæ at the base; the prosternum is wide and without striæ; the mesosternum is bisinuous and not marginate behind the keel; the anterior tibiæ are 4-dentate.

This species is smaller and less wide than *A. tener* and *A. Schaumi*, Mars., but the form of the sternal plates is very similar in the three species.

Hab. Dutch Timor (*W. Doherty*, 1892).

Apobletes rubrofemoratus, sp. n.

Oblongus, parallelus, convexiusculus, niger, nitidus; fronte punctata, stria integra; pronoto stria marginali pone caput interrupta; elytris striis 1–3 integris, 4 brevissima; pygidio convexo, ocellato-punctato, tibiis anticis 5-dentatis.
L. 3 mill.

Oblong, parallel, a little convex, black and shining, legs reddish brown, with the thighs distinctly red; the head is concave anteriorly in the region of the stria, stria complete, surface irregularly punctured, punctures fine, with larger ones interspersed, on the vertex there is more or less a cluster of points; the thorax, the marginal stria is interrupted behind the middle of the neck and is sinuous laterally, the lateral border is rather evenly punctured, the points not encroaching on the interior area; the elytra, striæ 1–3 parallel to each other and complete, 4 very short and apical, there are two punctures at the base, the outer one apparently represents an appendage to the fourth stria, the inner represents all there is of the fifth stria, there is no sutural; the propygidium has a scattered irregular punctuation with fine points intermixed; the pygidium has a more even and ocellate punctuation, but the punctures are not closely associated, the surface of the segment is convex; the prosternum is without striæ; the mesosternum is bisinuous, with a very distinct marginal stria, which is angulate on either side; the anterior tibiæ are 5-dentate.

The general outline of this species is similar to that of *Platysoma Dufali*, Mars., but the form of the sterna is that of an *Apobletes*.

Hab. Mahé, Malabar.

Apobletes Foersterii, sp. n.

Oblongo-ovatus, complanatus, nigro-piceus, nitidus; pedibus brunneis; fronte punctulata, stria integra; pronoto lateribus parce sed distincte punctulato; elytris striis 1–2 integris, 3 in medio subinterrupta, 4 apicali; prosterno bistriato; mesosterno stria marginali late interrupta; tibiis anticis 4-dentatis.
L. 3–3½ mill.

Oblong-oval, depressed, pitchy black; the head feebly impressed in front, stria complete, strong over the eyes, transversely fine and very feebly bisinuous, surface throughout with thinly scattered points; the thorax narrowest at the anterior angles, marginal stria strong from the base round the anterior angle, fine and irregularly crenulate anteriorly, with an indication of being broken behind the eye, surface sparingly punctured, points very fine on the disk, but more distinct laterally, with a few larger points near the base opposite the first elytral stria; the elytra, outer humeral strong and complete, inner wanting, 1–2 dorsal complete, 3 almost complete but a little broken and punctiform in the middle, 4 apical and short, there are fine and somewhat obscure punctures on the interstice between the humeral and first dorsal striæ and some more distinct in the apical area; the propygidium has two shallow foveæ and is clearly but not densely punctured, especially at the sides; the pygidium is similarly but more evenly punctured; the prosternum, the anterior lobe is distinctly punctate, keel with a few very fine points, bistriate, striæ sinuous; the mesosternum is marginate on each side only, not behind the keel, the suture between the sterna is scarcely traceable; the anterior tibiæ are 4-dentate.

The general form of this species resembles *A. mysolicus*, Mars.

Hab. Sumatra (*Dr. Foerster*).

Platysoma scalptum, sp. n.

Oblongum, subdepressum, nigrum, nitidum; fronte haud excavata, stria integra; pronoto striis marginali et laterali integris; elytris striis, subhumerali ab humero ad suturam distincte continuata, 1–3 integris, 4–5 abbreviatis; propygidio pygidioque subocellato-punctatis, hoc haud convexo; tibiis anticis 4-dentatis. L. 4 mill.

Oblong, rather depressed, black and shining; the head not excavated, frontal stria complete, strong, and nearly straight anteriorly; the thorax, marginal stria very fine, lateral stria close and parallel to it and joining it behind the eyes, well within the lateral stria, but near the middle of the lateral border are some conspicuous scratches or broken striæ, which are very characteristic, the surface is impunctate; the elytra, striæ, the outer humeral is complete and well-marked and is continued along the apical edge and a short distance round the sutural angle, dorsal striæ 1–3 complete, 4 almost dimidiate, 5 somewhat longer, sutural wanting, unless the terminal end of the outer humeral represents it; the propygidium and the pygidium are densely and coarsely punctate; the prosternum is rather narrow and without striæ; the mesosternum is formed similarly to that of *P. Confucii*, Mars., but the marginal stria is complete; the anterior tibiæ are 4-dentate.

Hab. Mahé, Malabar.

Platysoma Thugnaum, sp. n.

Oblongo-ovatum, parum convexum, nigrum, nitidum; fronte impressa, stria integra; pronoto (basi excepta) impunctato; elytris striis 1–4 integris, 5 ultra medium abbreviata; propygidio pygidioque grosse punctatis, hoc utrinque profundo foveolato; mesosterno marginato, late sinuato.
L. 3¼–3½ mill.

Oblong-oval, convex above, black and shining; the head feebly punctulate, impressed anteriorly, stria complete and nearly straight in front; the thorax smooth, with a row of punctures on each side along the basal edge, scutellar fovea extremely minute, marginal stria complete; the elytra, striæ 1–4 complete, 5 equidistant between the fourth stria and the suture, it reaches beyond the middle and anteriorly turns very slightly away from the suture, the sutural stria is wanting; the propygidium is transversely densely punctate, punctures large and ocellate, but along the base there are only small irregular points; the pygidium is similarly punctate, with a very conspicuous fovea on either side and a smooth posterior rim; the prosternum, the keel is narrow in the middle and without striæ; the mesosternum is widely sinuous anteriorly, with a well-marked marginal stria; the anterior tibiæ are 5-dentate, the two apical teeth are a little separated from the third.

This very distinct species may be placed near *P. integrum*, Sch.

Hab. Mahé, Malabar.

Platysoma vicinale, sp. n.

Oblongo-ovatum, parum convexum, nigrum, nitidum; fronte punctata, tenuiter impressa, stria integra; elytris striis 1–4 integris, 5 et suturali abbreviatis; propygidio pygidioque grosso punctatis, hoc postico marginato.
L. 3 mill.

Oblong-oval, little convex above, black and shining; the head is obtusely angulate over the eyes, surface rather densely punctured, punctures varying in size, largest before the middle of the neck, stria complete and strongly sinuous over the eyes; the thorax punctured like the head near the anterior angles, finely punctulate on the disk, marginal stria strong at the sides and crenulate behind the neck; the elytra, striæ, outer humeral fine and complete, inner does not quite reach the base and is shortened just at or before the middle, and it is somewhat deep and wide and has a short basal appendage, there is also an oblique stria, dorsal 1–4 complete, 5 apical and not reaching the middle, sutural shorter, broken and ill-defined, along the apical margin are a few scattered punctures; the propygidium is irregularly punctate, with fine points along its base; the pygidium has similarly large punctures more evenly set, and the posterior rim is raised; the prosternum is sparingly and finely punctulate and is without striæ; the mesosternum is sinuous behind the keel and the marginal stria is complete; the anterior tibiæ are 4–5-dentate.

Somewhat similar to *P. baliolum*, Lew., but more oblong and more depressed, and the dorsal striation is different. The punctuation of the pygidia is very similar in both species, but the pygidium is not marginate in *P. baliolum*.

Hab. St. Thomas, Gulf of Guinea (*Mocquerys*).

Platysoma obliquum, sp. n.

Elongatum, depressum, nigrum, nitidum; fronte punctulata, transversim haud striata; pronoto stria marginali antice interrupta; elytris striis, 1 apice subabbreviata, 2–3 integris, 4 apicali, suturali paullulum longiore, obliqua; prosterno striis antice divergentibus, postice abbreviatis; mesosterno sinuato haud marginato; tibiis anticis 4-dentatis.

L. 3–3½ mill.

Elongate, depressed, black and shining; the head very lightly impressed anteriorly, surface punctulate and striate over the eyes only; the thorax, marginal stria interrupted behind the middle of the neck; the elytra, striæ, outer humeral complete, inner wanting, dorsal 1 slightly abbreviated apically, 2–3 complete, 4 very short and apical, 5 wanting, sutural longer than the fourth, oblique and abbreviated apically; the propygidium and pygidium are slightly convex, evenly and not densely punctulate, the apex of the latter is almost smooth; the prosternum is bistriate, striæ divergent anteriorly and do not pass beyond the coxæ behind; the mesosternum is broadly sinuous, with a short hamate stria on either side not close to the margin nor reaching the posterior edge; the metasternum and the first segment of the abdomen have a well-marked lateral stria; the anterior tibiæ are 4-dentate.

The species of this genus are probably very numerous in Madagascar, but those known at present are the above, *P. quadricollis*, Lew., *P. Richteri*, Sch., *P. pulvinatum*, Sch., and *P. Fairmairei*, Théry, all very distinct species.

Hab. Fort Dauphin, Madagascar.

Eblisia Nairii, sp. n.

Oblongo-ovata, depressa, nigra, nitida; fronte impressa, stria integra; pronoto stria laterali a margine distanti pone oculos retrorsum acuminata; elytris striis 1–3 integris, 4–5 dimidiatis, suturali simillima, sed postice abbreviata; pygidio lævi utrinque profunde excavato.

L. 3⅔ mill.

Oblong-oval, depressed, black and shining; the head impunctate, frontal stria well-marked and slightly bent, with a shallow and somewhat wide impression behind it; the thorax, stria complete, strong and sinuous laterally, and somewhat distant from the margin (like that of *Phelister Steinheili*, Mars.), less deep and arched behind the anterior angle, and acuminately reflexed behind the eyes; the elytra, striæ 1–3 complete, 4–5 coequal and dimidiate, sutural similar to the fifth but shortened apically; the propygidium has a transverse median band of deep irregular punctures; the pygidium is smooth, with two large and deep comma-shaped excavations at the base; the prosternum, the keel is rather narrow and posteriorly semicircular in outline, between the coxæ are two striæ, which diverge behind, and apparently but not distinctly join in front; the mesosternum is widely sinuous and has a well-marked stria which is only marginal at the sinuosity, it continues along the side of the metasternum, and behind the angles of the mesosternum there is a short outer stria; the metasternum and the first segment of the abdomen are laterally bistriate; the anterior tibiæ are 5-dentate.

Hab. Mahé, Malabar.

Eblisia pagana, sp. n.

Ovata, depressa, nigra, nitida; fronte impressa, stria integra; pronoto stria laterali a margine distanti pone angulos acute angulata; elytris striis 1–3 integris, 4 apicali haud dimidiata, 5 et suturali ultra medium abbreviatis; pygidio profunde bifoveolato; tibiis anticis 5-spinosis.

L. 3 mill.

Oval, depressed, black and shining; the head sparsely punctulate, stria well-marked and feebly sinuous, forehead impressed behind the stria; the thorax, stria complete, strong and sinuous laterally, and somewhat distant from the margin except at the base, where it turns inwards, behind the angles (where a feeble punctuation is visible) the stria is finer and distinctly angulate; the elytra, striæ 1–3 complete, 4 apical and one third of the elytral length, 5 reaches just beyond the middle, the sutural is slightly shorter; the propygidium and pygidium are microscopically strigose over their whole surfaces, the first is irregularly punctured, the second has a deep somewhat circular fovea on either side at the base, which is obscurely punctured between the foveæ; the prosternum, the keel is rather narrow and without striæ; the mesosternum is rather widely emarginate and has a bent stria on either side, which is continued laterally along the metasternum, transversely there is a median arched stria, which is common also to the metasternum; the first abdominal segment is laterally bistriate; the anterior tibiæ are 5-spinose.

Hab. Tongking, "Montes Mauson, alt. 2300 feet" (*H. Fruhstorfer*).

Eblisia infans, sp. n.

Ovata, parum convexa, punctulata, picea, nitida; fronte stria transversa bisinuata, utrinque interrupta; pronoto stria laterali antice abbreviata; elytris striis 1–4 integris, 5 ultra medium, suturali basi, abbreviatis; prosterno haud striato; mesosterno bistriato; tibiis anticis 5-dentatis.

L. 1¾ mill.

Oval, rather convex, piceous and shining; the head sparsely punctulate on the vertex, stria bisinuous and interrupted near the eyes; the thorax, the lateral stria is distant from the margin, but turns towards it at the base, and it is much shortened in front, behind the anterior angles the marginal stria faint and arched (like that in *E. Nairii*), but behind the neck it is stronger and crenulate, the scutellar puncture is very small but distinct, and close in front of it is a second even smaller; the elytra, striæ 1–4 complete, 5 extends beyond the middle, sutural is shortened well before the base; the propygidium is distinctly punctate; the pygidium is smooth and has two deep lobe-shaped excavations placed transversely at the base; the prosternum, the keel is narrow and without striæ and the anterior lobe is punctate; the mesosternum is widely emarginate, the marginal stria is complete and close to the edge at the emargination only, the transverse stria is widely arched, both these striæ are rather fine and both continue along the metasternum, the surfaces of the meso- and metasterna are distinctly but not densely punctulate; the anterior tibiæ are 5-dentate.

This is the smallest species of the genus known.

Hab. Sumatra.

MEGALOCRÆRUS, gen. nov.

Corpus cylindricum; caput rotractile; epistomum excavatum; frons utrinque marginata; mandibulæ æquales, robustæ; antennæ foveolis in angulo prothoracis detectis; pronotum stria marginali integra; elytra 6-striata; prosternum basi truncatum, marginatum; mesosternum antice sinuatum; propygidium transversum, breve; pygidium semicirculare vix convexum; tibiæ fossa tarsali recta, parva et profunda.

The genus established here is represented by a species having the superficies of *Pachycrœrus*, but the mesosternum is not produced anteriorly and the tarsal grooves in the anterior tibiæ are straight. The antennal fossettes are similar to those of *Exosternus*.

Megalocrærus rubricatus, sp. n.

Cylindricus, robustus, niger, nitidus; elytris basibus late rubris, striis 1–6 integris, tenuiter impressis; prosterno bistriato; mesosterno antice late sinuato; propygidio pygidioque punctatis; tibiis anticis 5-dentatis.

L. 4 mill.

Cylindrical, robust, black and shining, the elytra broadly imbricate at their bases except on the sutural border; the head is feebly punctulate and the lateral stria well-marked over the eyes; the thorax, marginal stria complete but extremely fine anteriorly, along the lateral border the punctuation is similar to that on the head; the elytra, striæ are fine, outer humeral and 1–6 dorsal complete, the fifth and sutural being joined at the base, of the inner humeral there is only a trace behind the middle; the propygidium and pygidium are clearly punctate, the points on the latter are the more evenly set; the prosternum is bistriate, striæ parallel; the mesosternum is widely sinuous anteriorly and the marginal striæ continue along the sides of the metasternum; the anterior tibiæ are 6-dentate and the intermediate and posterior are also very similarly dentate.

Hab. Jataby, Province Goyas, Brazil. There is an example also in the British Museum taken by A. R. Wallace in the Amazon Region.

Pachycærus prasinus, sp. n.

Ovalis, parum convexus, supra viridi-metallicus; fronte distincte punctulata; elytris striis 1–4 integris, 4 tenuiter impressa, 5 dimidiata, suturali basi abbreviata; propygidio pygidioque sat dense punctatis; tibiis paullulum dilatatis.

L. 3¾ mill.

Oval, somewhat convex, brightly green above; the head is wider and more clearly punctulate, with the marginal stria less deeply impressed than in *P. cyanescens*, Er.; the thorax is more transverse, but similarly punctate to that of *cyanescens*, and the marginal stria is like it interrupted behind the neck; the elytra, striæ, outer humeral is fine, apical and dimidiate, inner also fine and more complete, but shortened apically, 1–4 dorsal complete, but the fourth is much finer than the third, especially at the base, 5 fine, apical, and scarcely reaching the middle, with a small puncture as a basal appendage, sutural fine and abbreviated before the base; the pygidia are similarly but more closely punctured than those of *cyanescens*; the prosternum, the striæ are closer together than those of *cyanescens*, are parallel laterally, and slightly divergent at the base, the surface of the keel is microscopically strigose and the anterior lobe is punctate; the mesosternum, marginal stria is complete, rather fine, and feebly sinuous, and it does not follow the outline of the anterior edge; the anterior tibiæ are 4–5-dentate, and all the tibiæ are much wider than those of *cyanescens*.

This species is relatively broader than *P. cyanescens*, Er., and the prosternal striæ are parallel and nearer together, resembling more closely those of *P. cæruleatus*, Lew., although they are more strongly impressed.

Hab. Mpudzi River, Manica, Gazaland (*Guy A. K. Marshall*, 1901).

Pachycrærus ellipsodes, sp. n.

Ellipticus, parum convexus, niger, nitidus; pronoto stria marginali antice late interrupta; elytris striis 1–4 integris, 5 dimidiata, suturali basi evanescenti; prosterno bistriato; mesosterno marginato; tibiis anticis 5-dentatis.

L. 4½ mill.

Elliptical, rather convex, black and shining; the head, frontal stria complete and angulate before the eyes, surface punctulate, with some larger points along the base; the thorax, lateral stria is continued anteriorly only as far as behind the eyes, the punctuation is similar to that of the head, but it is somewhat dense laterally and the finest points are before the scutellum and on the disk; the elytra, striæ, the outer humeral is apical and dimidiate and deepest in the anterior portion, dorsal 1–4 complete, 5 dimidiate, with a basal punctiform appendage, sutural is evanescent at the base, along the apical border are a few punctures; the propygidium is irregularly, not closely punctured, some of the punctures are ocellate, and between them are others very fine; the pygidium is similarly punctured, but the larger points do not extend to the apex; the prosternum, keel bistriate, striæ nearly parallel to each other, but slightly widening out behind, and they are not joined in front, there are a few fine punctures between the striæ, and the surface is microscopically strigose, the punctuation is denser on the anterior lobe; the mesosternum is marginate and the acumination rather minute, the surface with that of the metasternum has a very fine punctuation; the anterior tibiæ are 5-dentate.

In general outline this species agrees with *P. morulus*, Lew., which is the only other elliptical species known.

Hab. St. Thomas's Island, Gulf of Guinea.

STENOTROPHIS, gen. nov.

Body short, cylindrical, and truncate; head retractile, epistoma excavated, mandibles very robust and very strongly dentate; antennæ, club orbicular in outline, joints 3–7 moniliform and equal in size; antennal fovea is in the angle of the thorax and not open as in *Pachycræerus*; thorax transverse and marginate at the sides; elytra, dorsal striæ short and incomplete; prosternum, keel very narrow, parallel at the sides, and bistriate; mesosternum produced in the middle; pygidium semicircular and convex; anterior tibiæ with 9 coequal and equidistant teeth, the anterior femora are grooved and strongly dilated at the tibial end on the anterior edge, somewhat similar but more explanate than in *Phelister Simonii*, Lew. (fig. 1, Ann. & Mag. Nat. Hist. p. 46, July 1889).

Type *Pachycræerus cavifrons*, Lew.

This genus should be placed next to *Chalcurgus*, in which the antennal fossette and narrow sternal keel are very similar.

I have recently received four examples of *S. cavifrons*, Lew., from Usambara which are metallic blue, but the type is brassy green and is from N. Kamerun. I cannot see any other difference, and so conclude that the species has a wide range. Mr. Guy A. K. Marshall has lately found *Macrosternus Lafertei*, Mars. (originally recorded from Senegal), in Gazaland, and I believe there are other species which extend from coast to coast on the African continent.

EXOSTERNUS, gen. nov.

Body oval, robust, rather convex, somewhat metallic; head retractile, forehead flat and punctate, epistoma distinctly separate; thorax marginate and the antennal fossettes are in the angle and not open like those of *Pachycræerus*; elytra, striæ, humeral and dorsal all complete; pygidium convex and semicircular behind; prosternum bistriate and incised at the base; mesosternum marginate, bisinuous, and produced in the middle like that of *Cypturus*; tibiæ, anterior 8–9-dentate and moderately dilated, intermediate and posterior more dilated and widest near the tarsi, the tarsi are short and rather robust, with two claws.

Exosternus manicatus, sp. n.

Ovalis, parum convexus, nitidus; fronte plana, rugoso-punctata; elytris striis humeralibus et dorsalibus integris, suturali antice cum 5^a juncta; prosterno bistriato; mesosterno marginato, in medio producto; tibiis dilatatis.

L. 3⅔ mill.

Oval, somewhat convex, nearly black and shining; the head, forehead plane, densely and rugosely punctured, and the transverse stria is almost obliterated by the sculpture; the thorax, marginal stria complete, surface clearly and densely punctured except before the scutellum, where the points are finer and less close; the elytra, striæ, inner and outer humeral and 6 dorsal all complete, minutely crenulate and rather fine, especially the fourth, fifth, and sutural, the sutural joins the fifth at the base, the apical margin is strigose; the propygidium is densely and somewhat rugosely punctured; the pygidium is more finely and clearly, not rugosely punctured; the prosternum, anterior lobe marginate in front, with punctures rather closely set together, keel bistriate, striæ faintly sinuous in the middle, surface sparingly punctulate; the mesosternum is marginate and bisinuous; the metasternum is sparingly and minutely punctured, transverse stria straight and finely crenulate, and it joins the lateral strong and oblique stria; the first segment of the abdomen has a small fovea on either side well within the margin; the anterior tibiæ are 8–9-dentate and are somewhat dilated and are bowed on the outer edge; the intermediate and posterior tibiæ are more dilated, especially at the tarsal end.

Hab. Mpudzi River, Manica, S. Africa (*Guy A. K. Marshall*), December 1901.

Exosternus æratus, sp. n.

Ovalis, parum convexus, subæneus, nitidus; fronte plana, rugoso-punctata; elytris striis omnibus integris; mesosterno in medio producto, marginato; tibiis dilatatis.

L. 3⅓ mill.

Oval, rather convex, somewhat brassy and shining, with the apical margin of the elytra reddish; the head densely and rather rugosely punctate, transverse stria obliterated; the thorax, marginal stria complete, surface somewhat closely punctured, points finest on the disk and before the scutellum; the elytra, striæ similar to those of the preceding species, except that the fifth and sutural are not so distinctly joined; the propygidium is rather densely punctured, punctures varying in size, some small and circular, others oblong and rather large, and a few are confluent, and it has a lobe-shaped but somewhat obscure elevation on either side; the pygidium is more finely and more evenly punctured; the prosternum, anterior lobe marginate and sparsely punctate, keel bistriate, striæ widely sinuous in the middle and not clearly meeting in front, surface of the keel with a few punctures smaller than those of the lobe; the mesosternum is marginal and bisinuous, surface finely and sparingly punctulate; the metasternum has a straight and fine crenulate stria, which joins the lateral stria, which is strong and oblique; the tibiæ are formed like those of *E. manicatus*, but are a little less dilated.

Hab. Dar-es-Salaam, German East Africa.

Phelister conquisitus, sp. n.

Rotundatus, parum convexus, piceus, nitidus; fronte haud striata; pronoto stria marginali integra, stria interna utrinque interrupta; elytris striis 1–3 integris, 4 in medio late interrupta, 5 apicali, suturali ultra medium abbreviata; propygidio distincte punctato: prosterno margine sulcato; mesosterno denso punctulato.
L. 2½ mill.

Rather convex, piceous and shining; the head feebly punctulate and without a frontal stria; the thorax, marginal stria fine and complete, lateral stria extremely fine and broken in the middle, behind the eyes it is again interrupted, and behind the neck clearly crenulate; the elytra, striæ 1–3 complete, 2–3 minutely hamate at the base, 4 short and basal, distinctly hamate anteriorly, with a short apical appendage, 5 apical and equal in length to the appendage of the fourth stria, sutural apical, but reaching beyond the middle, and irregularly crenulate; the propygidium is clearly punctate, punctures closest on the anterior portion; the pygidium is microscopically punctulate; the prosternum, anterior lobe margined anteriorly with an even and deep furrow, and coarsely punctate on either side before the suture, the median area is densely punctulate, keel broadest at the base, completely marginate, and the surface densely punctulate; the mesosternum is sculptured like the prosternum and marginate anteriorly, with an arched crenulate stria which continues to the base of the metasternum; anterior tibiæ 5-dentate.

Hab. Ulster, New York Province, U.S.A. (*H. H. Smith*).

Phelister foveicollis, sp. n.

Ovalis, parum convexus, piceus, nitidus; fronte excavata; pronoto conspicue bifoveolato, lateribus sparsim punctato; elytris striis 1–3 integris, 4 dimidiata, 5 apicali, suturali ultra medium abbreviata; prosterno parum lato, bistriato; mesosterno in medio haud marginato.

L. 2⅔ mill.

Oval, rather convex, piceous and shining; the head excavate and finely and sparingly punctulate, stria fine and interrupted behind the epistoma; the thorax conspicuously but not closely punctate laterally, but not close to the border, surface finely punctulate like the head, marginal stria complete, in a line behind the eye halfway before the base is a very conspicuous fovea on either side, and there is a minute fovea placed obliquely near each of the larger foveæ, the scutellar fovea is oval and very distinct; the elytra, striæ, inner humeral apical and rather wide, with a short finer median appendage, dorsal striæ 1–3 complete, the second turns away from the first at the base, 4 is apical and dimidiate and punctiform anteriorly, 5 apical and shorter and also punctiform anteriorly, sutural stronger and somewhat abbreviated before the base, at the base of each elytron there is a transverse bent stria, which is apparently an appendage to both the sutural and fourth striæ; the propygidium and pygidium (except at the apex) are clearly but not closely punctured; the prosternum is rather wide, bistriate, striæ sinuous between the coxæ and do not touch the base nor turn towards each other in front; the mesosternum has two short marginal striæ at either angle and a transverse arched crenulate stria which continues along the sides of the metasternum; the anterior tibiæ are 6–7 spinose.

Hab. Pará, Brazil (*H. H. Smith*).

Phelister hospes, sp. n.

Ovalis, parum convexus, piceus, nitidus; fronte leviter concava, stria integra; pronoto stria laterali ad angulos arcuata, pone oculos interrupta; elytris striis 1–3 integris, 4 basi subabbreviata, 5 dimidiata, suturali basi abbreviata; propygidio ocellato-punctato; pygidio dense et minute rugoso; prosterno bistriato, striis antice et postice conjunctis; tibiis anticis 6-dentatis.

L. 2 mill.

Oval, somewhat convex, piceous and shining; the head, stria complete and nearly straight anteriorly, forehead slightly concave behind the stria, surface sparingly and minutely punctulate; the thorax, marginal stria very fine and ceasing behind the eyes, lateral stria arched and feebly crenulate behind the anterior angles, interrupted behind the eyes, the stria is continued behind the neck, where it is crenulate and both its ends are reflexed, surface punctulate like the head, with a few large punctures scattered on either side of the disk, the scutellar fovea is longitudinal and acuminate anteriorly; the elytra, striæ 1–3 complete, 4 almost complete, 5 dimidiate with a few additional punctures, sutural two thirds of the elytral length, all the striæ have more or less crenulate edges; the propygidium is clearly and rather densely ocellate-punctate; the pygidium is minutely and densely rugose, with a few punctures visible here and there; the prosternum, the keel is very narrow behind the anterior lobe, and there is a marginal stria which is united at both ends; the mesosternum, the marginal stria is fine and widely sinuous, the transverse stria is also fine and feebly arched, and it continues laterally along the metasternum; the first segment of the abdomen is bistriate at the sides, the inner stria being continued along the basal edge; the anterior tibiæ are 6-dentate.

Hab. Ulster, New York Province, U.S.A. (*H. H. Smith*).

Omalodes foveipennis, sp. n.

Breviter ovatus, convexus, niger, nitidus; fronte punctulata, in medio profunde foveolata, stria integra, antice retrorsum acuminata; pronoto lateribus punctulato, margine haud sinuato; elytris bifoveolatis, striis dorsalibus punctorum lineis compositis; propygidio basi bifoveolato et in medio conspicue impresso; tibiis anticis 6-dentatis.

L. 6–6½ mill.

Shortly oval, convex, black and shining; the head clearly punctulate, with a deep fovea on the vertex, stria complete, with an anterior acumination similar to that of *O. sinuaticollis*; the thorax, marginal stria complete and strong, sides punctulate, especially behind the anterior angles, scutellar fovea small and shallow; the elytra, striæ, outer humeral fine and complete, inner less distinct, dorsal striæ all punctiform, 1–3 complete, 4–5 consist of a very few punctures and do not reach beyond the middle, the sutural is more conspicuous than the fourth, but does not reach the base, at the base of the third stria there is a conspicuous fovea; the propygidium has two large foveæ on either side with a median impression on the posterior edge, in and near the foveæ the punctures are rather large, but behind the median impression they are smaller; the pygidium has a rather large depression on either side of its base, and it is more regularly punctured than the propygidium; the prosternum and mesosternum are finely punctulate, the transverse stria of the latter is minutely crenulate; the anterior tibiæ are 6-dentate.

Omalodes sinuaticollis, Mars., has a similar elytral fovea to this species, and the two species are similar in outline, but the frontal fovea, sculpture of the pygidia, and the transverse stria between the meso- and metasterna are distinctive characters in *foveipennis*. In several specimens there are thoracic foveæ, but they are not constant either in number or position.

Hab. Province of Espirito Santo.

Hister boleti, Lew.

Hister boleti, Lew. Ann. & Mag. Nat. Hist. vol. xiii. p. 135 (1884).

The prosternum in this species is bistriate between the coxæ, and the mesosternal marginal stria is complete and punctate.

Hister mundulus, sp. n.

Ovatus, convexus, niger, nitidus; fronte punctulata, stria integra; pronoto stria interna antico late interrupta; elytris striis 1–4 integris, 5 ultra medium extensa, suturali ante basin abbreviata; propygidio pygidioque punctulatis.

L. 4½–5¼ mill.

Oval, convex, black and shining; the head finely and somewhat densely punctulate, stria complete and semicircular, but feebly irregular in its course; the thorax, marginal stria very fine laterally, but much more distinct behind the head, inner lateral not quite reaching the base, hamate and ceasing behind the anterior angle; the elytra, striæ, outer humeral short and median, inner wanting, dorsal 1–4 complete, 5 reaching just beyond the middle, sutural shortened before the base and turning away from the suture apically, all the striæ are crenulate; the propygidium and pygidium are somewhat faintly punctulate, very fine points are set in between the larger ones; the prosternum, anterior lobe margined with two striæ laterally, the outer stria the shorter, keel narrow between the coxæ; the mesosternum, marginal stria is complete and fine, also that of the metasternum, the latter continues conspicuously in a loop to the elytral margin; the anterior tibiæ are bifid, with three simple teeth above them.

This species is somewhat similar to *H. hamatitis*, Lew., especially in the form of the inner stria and the outline of the meso- and metasterna.

Hab. Sumatra (*Dr. Foerster*).

Hister tetricus, sp. n.

Late ovalis, convexiusculus, niger, nitidus; stria frontali integra, antice sinuata; pronoto stria unica, basi abbreviata, angulo antice foveolato; elytris striis 1–4 integris, 5 basi incurva, abbreviata, suturali ultra medium extensa; tibiis anticis 5–6-denticulatis. L. 3⅔ mill.

Broadly oval, rather convex, black and shining; the head, frontal stria complete and sinuous anteriorly; the thorax, lateral stria is shortened at the base, and there is a circular fovea at the angle, fovea smaller than that of *H. geminus*, Er., and without punctures, the surface has a shallow leather-like sculpture and a fine but obscure punctuation; the elytra, there is a fine oblique humeral stria and an indication of an inner humeral at the apex, 1–4 dorsal are strong and complete, 5 is shortened before the base and incurved anteriorly, sutural reaches beyond the middle and apically turns away from the suture; the punctuation of the pygidia is microscopical; the prosternum, anterior lobe strongly marginate, keel narrow before the coxæ and without striæ; the mesosternum is widely arched anteriorly, but the marginal stria is complete and more arched, it does not quite follow the outline of the anterior edge; the anterior tibiæ are dilated near the tarsi, and have five or six small denticulations.

The superficies of this species resembles that of *H. sessilis*, Lew.

Hab. Sumatra.

[To be continued.]

XXXI.—*Descriptions of Five new Species of* Locustidæ *from South Africa.* By W. F. KIRBY, F.L.S., F.E.S.

SINCE the publication of my papers on South-African Locustidæ in the 'Transactions of the Entomological Society of London' for 1902 Mr. Distant has submitted a few more specimens to me for examination, among which I find three species of the genus *Heteropternis*, Saussure, and one each of *Dittopternis*, Saussure, and *Caloptenopsis*, Bolivar, which appear to be new and which I therefore describe below.

1. *Dittopternis* (?) *rosacea.*

Long. corp. 19 millim.; exp. al. 40 millim.

Male.—Head, thorax, four front legs, and base of tegmina yellowish grey, mottled with black, almost the terminal half of the tegmina hyaline, sparingly reticulated with black; abdomen, face, and under surface yellowish; wings rose-colour, with the apex hyaline, separated by a black band, curved outwards below the costa, round the hind margin, but ceasing before reaching the anal angle; hind femora black inside, with a yellow ring before the tip, outside yellowish grey, mottled with black; upperside banded with black and yellowish grey and with a row of raised black points; hind tibiæ and tarsi bright red; base of tibiæ and tips of spines black.

Hab. Eureka, Barberton (*Rendall*).

A very distinct species.

2. *Heteropternis guttifera.*

Long. corp. 21 millim.; exp. al. 36 millim.

Male.—Brown, indistinctly mottled with darker, blackish towards the front of the rostrum below, on the hinder part of the pronotum, on the basal segments of the abdomen above, and towards its extremity. Hind femora brown, mottled with black, the under surface bright red; hind tibiæ blackish, with a narrow and broad yellow belt towards the base, a longitudinal yellow band above before the extremity, and the tarsi mostly yellowish. Tegmina brown towards the base, irregularly mottled with yellowish white; towards the extremity the cells are whitish subhyaline, with a brown streak or spot in the centre of each. Wings hyaline, narrowly brown along the costa, and with the tip inclining to brownish; possibly with the nervures reddish or yellowish towards the base during life.

Hab. Eureka, Barberton (*Rendall*).

3. *Heteropternis Saussurei.*

Long. corp. 26 millim.; exp. tegm. circa 45 millim.

Female.—Head, thorax, and antennæ black, mottled with yellow; behind the eyes run converging pale bands (perhaps red in life), partly macular, crossing each other, and ending in a large spot on each side at the base of the hinder lobe of the pronotum. Abdomen blackish, mostly yellow beneath, and shining, and varied with testaceous or reddish on the sides. Hind femora black, thickly and transversely mottled with yellow outside, red towards the base on the inside beneath. Hind tibiæ red, with a black stripe on each side, and red spines; the black stripes are broadly interrupted towards the base and that on the outer side is spotted with yellow on its upper portion below the interruption. Inner spine twice as long and thick as the outer; tarsi dull red. Tegmina blackish towards the base and yellowish subhyaline, irregularly clouded and reticulated with brown, beyond. Wings hyaline, brown towards the margins.

Hab. Zoutpansberg (*Distant*).

Described from a single damaged specimen labelled "*H. hyalina*, Sauss.," but it does not well agree with the description of that species.

4. *Heteropternis pallida.*

Long. corp. 28 millim.; exp. tegm. 37 millim.

Female.—Light brown, cheeks smooth, varied with ivory-white; back of pronotum mottled with black, the sides with a short oblique blackish band, and the back above semicircularly blackish to the extremity over the greater part of the hinder lobe; tegmina light subhyaline brown, with brown and reddish-brown spots, nervures, and reticulations, the outer third clearest; the longitudinal spots darkest towards the base in the subcostal area. Wings hyaline, with the nervures on the costal third blackish, except at the base, the costal nervure, and the longitudinal nervure above the last two blackish ones, and all between the latter and the inner margin, which are yellowish or whitish. Palpi reddish brown, yellowish towards the base; legs reddish brown, femora paler, hind femora slightly mottled with brown, with two slightly marked brown transverse bands above, marked on the upper carina with black spots; the upper lateral carina marked with more numerous small black longitudinal spots and the lower carina with much larger ones; hind femora with black-tipped spines; abdomen light brown, indistinctly marked, the valves black, reddish at the base.

Hab. Figtree Creek, Barberton (*Rendall*).

Probably allied to *H. hyalina*, Sauss.

5. *Caloptenopsis femoralis.*

Long. corp. 30 millim.; exp. al. 65 millim.

Female.—Light brown, cheeks and lower mouth-parts varied with glaucous white, sutures of face partly bordered with blackish; front with a median blackish band extending upwards and over the greater part of the pronotum above:

median and terminal carinæ mostly yellowish; pronotum above with large depressed punctures; the lateral carinæ bordered with black below in front; the sides with a short oblique band in the middle in front, brown above, and yellowish, edged with blackish, below; hind femora glaucous white outside and below; the outer space marked with orange curves or angles, spotted with black; the upper part alternately banded with black and testaceous; the inside of the femora rich purple nearly to the extremity; hind tibiæ and tarsi light purple above and on the inside, glaucous white on the outside; tibial spines white, tipped with black; tegmina yellowish, subhyaline, more opaque towards the base, medial area with a row of dark brown spots, separated by pale yellowish spaces; beyond these are larger but paler brown blotches, the spaces between the crowded nervures mostly spotted with pale yellowish, and beyond those are irregular brown spots almost to the tip. Above the central area runs a row of small blackish spots for half the length of the tegmina. Wings greenish hyaline, unclouded.

Hab. Pretoria (*Distant*).

A very distinct species, easily recognizable by the colour of the legs.

XXXII.—*A new Dik-Dik from British East Africa.*

By Oldfield Thomas.

Among the specimens contributed by Dr. S. L. Hinde to the National Museum is a fine Dik-Dik from Kitui, and this appears to differ so much from the ordinary *Madoqua Kirkii* of East Africa as to deserve at least subspecific distinction. It may be called

Madoqua Kirkii Hindei, subsp. n.

Size rather larger than in true *M. Kirkii*. Coloration much more fulvous throughout. Mesial area of back bright grizzled fulvous, very different to the dull yellowish grey of *M. Kirkii*. Sides brighter and clearer fulvous than in *M. Kirkii*, and the belly even, at least laterally, is strongly suffused with the same colour. Legs deep reddish fulvous. White eye-markings well defined and conspicuous. Long hairs of crest deep reddish fulvous for their basal three fourths, their tips deep black. Ears with the upper half of their anterior margins edged with black externally.

Skull much as in *M. Kirkii.* Nasals more bent down and compressed laterally than usual. Premaxillæ just touching nasals above.

Skull-dimensions of the type (a female, just adult):—

Greatest length 109 millim.; zygomatic breadth 53·5; tip of muzzle to tip of nasals 34; nasals 18·7 × 16; muzzle to orbit 52·5; breadth of brain-case 43·7; muzzle to front of anterior premolar 24.

Hab. Kitui, British East Africa. Altitude 3500 feet.

Type. Female. B.M. no. 0. 9. 4. 2. Collected 27th July, 1900, and presented by Dr. S. L. Hinde.

The strong fulvous colour of this form will readily distinguish it from any of its allies.

XXXIII.—*On a new Monkey from Nyasaland.*

By Oldfield Thomas, F.R.S.

Among a small collection of mammal-skins from Nyasaland presented by Mrs. H. R. Mill to the National Museum there occurs an example of a new monkey of the *Cercopithecus albigularis* group, which I propose to name in honour of its donor.

Cercopithecus Francescæ, sp. n.

General characters of *C. albigularis*, but smaller. Colour of body much darker and greyer, with less yellowish—the yellow being restricted to a narrow area along the back, and the hairs even then being only quite narrowly ringed subterminally with this colour; their basal three-fourths dark slaty grey and their tips black. Elsewhere, on head, nape, shoulders, flanks, and hips, the colour is dark blackish grey, finely grizzled with whitish. Hairs bordering ears on inner side bright reddish or fulvous. Usual light neck-patch present, dull white, not specially sharply defined, and not encroaching upon the back of the neck. Limbs below elbows and knees black. Tail long, its base grizzled like the body, the rest dull black.

Approximate dimensions of the type, a native-made flat skin:—

Head and body 450 millim., tail 620.

Hab. Near Mt. Waller, western side of Lake Nyasa; high up on the plateau.

Type. B.M. no. 2. 7. 24. 1. Collected by the Rev. James Henderson, and presented by Mrs. Frances Mill.

This striking monkey is readily distinguished from all its allies by its red ears and the reduction of the yellow in its body-colour. Its geographical ally, *C. Moloneyi*, is particularly strongly coloured on the back.

XXXIV.—*On Two new Hares allied to* Oryctolagus crassicaudatus. By OLDFIELD THOMAS.

A RENEWED examination of the South-African hares of the remarkable *Oryctolagus crassicaudatus* group has convinced me that not only is the form from Nyasa previously determined as *O. crassicaudatus* worthy of being distinguished, but also that another hare from the Orange River Colony, collected some years ago by Mr. A. W. Curry, should also be described as new.

Good material for the description of the true *O. crassicaudatus* of the Cape is still wanting, and I am at present by no means certain whether the type of Smith's *Lepus rupestris* (B.M. no. 45. 7. 3. 8) is only a young specimen of *O. crassicaudatus* or represents another definable form. In colour it closely agrees with the older known form, and is therefore unquestionably distinct from the small *O. c. Curryi* described below. A large *O. crassicaudatus* has a hind-foot length of 97 millim. (s. u.) and a greatest cranial length of 92 millim.; in the type of *L. rupestris* these measurements are respectively 71 and 69 millim.

Whether these hares are best considered as subspecies of *O. crassicaudatus* or as *species* of a *crassicaudatus* "group," I am doubtful, but, for the sake of showing their relationship, I provisionally adopt the former method. I am, however, by no means convinced that this is the proper solution of the difficulty.

Oryctolagus crassicaudatus nyikæ, subsp. n.

Lepus crassicaudatus, Thos. P. Z. S. 1897, p. 938 (nec Geoff.).

Size markedly less than in the true *O. crassicaudatus*, the feet particularly short and stumpy; ears also decidedly shorter. Coloration essentially as in that animal, the head and body grizzled greyish fawn, the rump more rufous. Individually the longer hairs of the back are black, with a subterminal buffy band and a paler base, and the wool-hairs are pale slaty grey for their basal halves, then buffy and the tips black. On the rump the buffy of the wool-hairs becomes more tawny and at the same time less hidden by the longer hairs, thus producing the general effect of a more rufous rump. Under surface dull buffy or tawny, the bases of the hairs slaty. Head clearer grey than the back, the cheeks especially being without buffy suffusion. Ears short, clear grey, their backs rather darker than their inner surface; their inconspicuous fringes dull whitish. Nape-patch dull tawny. Chin buffy whitish; chest grizzled buffy, like sides. Limbs deep tawny proximally, paling to dull buffy terminally. Tail thick and long, wholly tawny rufous, without dark tip; a few of the terminal hairs only with inconspicuous dark ends.

Skull smaller in all dimensions than that of *O. crassicaudatus*, but of about the same general proportions. Shoulder-like expansions at the anterior bases of the zygomata, projecting considerably both forward and outward. Palatal foramina very large, widely open, their greatest breadth exceeding the antero-posterior diameter of the palatal bridge, which is far narrower than in *O. crassicaudatus*. Molars with the peculiar characteristic structure found in *O. crassicaudatus*.

Approximate dimensions of the type (measured in skin):—

Head and body 385 millim.; tail 100, with hairs 130; hind foot (s. u) 74; ear 55.

Skull: greatest length 82; zygomatic breadth 40; nasals 38 × 17; interorbital breadth 16·5; intertemporal breadth 13·5; diastema 26; palatal foramina 24 × 8·3; palatal bridge 7·8.

Hab. Nyika Plateau, Northern Nyasaland. "On the highest peaks, at about 7000 feet."

Type. Adult male. B.M. no. 97. 10. 1. 254. Collected June 1896 by Mr. A. Whyte, and presented by Sir Harry Johnston, K.C.B. Two specimens.

This hare differs from *O. crassicaudatus* by its smaller size, shorter feet and ears, longer and more wholly red tail, and by the cranial details described above.

Oryctolagus crassicaudatus Curryi, subsp. n.

Size smaller than in true *O. crassicaudatus*; about as in *O. c. nyikæ*; feet short, but ears longer than in *nyikæ*. General colour far more rufous than in the other forms, mainly owing to the very different colour of the underfur. Longer hairs of back with a short black tip, a subterminal buffy ring, succeeded by a slightly darker part, below which the long and very thin basal portion is dull whitish. Wool-hairs with inconspicuous black tips, below which they are *wholly rufous*[*] *to their bases.* This is the case all over the body, above and below, except just on the cheeks, where the hairs are slaty based as usual. Under surface only differing by the longer hairs being broadly whitish terminally, without black tips. Tail deep rufous, the hairs at the end tipped with blackish.

Skull markedly smaller and narrower in the interorbital region than in true *crassicaudatus*, both interorbital and intertemporal dimensions decidedly less than in the other forms. Antero-external zygomatic projections much less developed than in *O. c. nyikæ*. Palatal foramina narrower than in the latter, palatal bridge equally small. Bullæ larger than in true *crassicaudatus*.

Dimensions of the type, stated to have been taken in the flesh:—

Head and body 365 millim.; tail with hairs 93; hind foot (s. u.) 78; ear 72.

Skull: greatest length 81; basilar length 63; zygomatic breadth 39; nasals 40 × 16; interorbital breadth 13·2; intertemporal breadth 11·8; diastema 26·5; palatal foramina 25 × 7·5; palatal bridge 7.

Hab. Boshof, Orange River Colony.

Type. Female. B.M. no. 97. 6. 6. 1. Collected and presented by Mr. A. W. Curry. One specimen.

This striking animal is no doubt the high veldt representative of the *crassicaudatus* group. Intermediate in geographical position, it is more distinct from either of the other two forms than they are from each other.

XXXV.—*New Forms of* Saimiri, Oryzomys, Phyllotis, Coendou, *and* Cyclopes. By OLDFIELD THOMAS.

Saimiri boliviensis nigriceps, subsp. n.

General colour of the true *S. boliviensis* (better but erroneously known as *S. entomophagus*[†]), but with the crown of the head deep black, the black ends to the hairs, as in *S. Œrstedi*, completely covering their grey bases, and rendering the whole top of the head an almost unmixed glossy black. Vertical dark line in front of ears strongly marked. Auricular white patch well defined, sharply contrasting with the black cap; hairs on inner surface of ears yellow. Back of the same grizzled yellowish as in true *boliviensis*. Under surface and inner side of limbs proximally clear pale yellow. Forearms and hands and hind feet rich golden yellow to the tips of the digits; in *boliviensis* the fingers and toes, beyond the metapodials, change to dull whitish yellow. Tail dull grizzled yellow above, with a black tip; clear yellow along the middle line below.

---

[*] Between "vinaceous-cinnamon" and "cinnamon-rufous."

[†] *Callithrix boliviensis*, Is. Geoffr. & Blainv. N. Ann. Mus. iii. p. 89 (1834).

Calitrix entomophagus, d'Orbigny, Voy. Am. Mérid., Atlas Mamm. pl. iv. (1836).

Saimiris entomophagus, d'Orb. op. cit. Texte, p. 10 (1847).

Dimensions of the typical skin:—

Head and body 330 millim.; tail 400; hind foot 76.

Skull: extreme length 66; zygomatic breadth 41·5; breadth of brain-case 35; basal length 42.

Hab. Cosnipata, Eastern Peru.

Type. Male. B.M. no. 69. 5. 13. 1. Collected 19th October, 1868, by Mr. H. Whitely.

This monkey is no doubt the "*Chrysothrix entomophaga*, D'Orb." of Wagner [*], who looked upon his deeply black-capped specimens, collected by Natterer on the Mamoré, as the fully developed form of D'Orbigny's animal. But the examples, practically topotypical, collected by Mr. Bridges in Bolivia are all perfectly uniform, young and old, and it is also one of these that Schlegel [†], after referring to the colour of the cap, states to be "tout-à-fait semblable" to a typical specimen from Guarayas obtained during D'Orbigny's voyage.

S. b. nigriceps has just about the same deep black cap as *S. Œrstedi*, from which it differs by its dull yellowish body.

Oryzomys phæopus olivinus, subsp. n.

Similar to the typical form in all essential respects, but instead of the dark umber-brown of true *phæopus*, the general colour is grizzled olivaceous or bistre, almost as in the common Akodons of this region. Feet dark grey, not so blackish as in *phæopus*.

Skull and teeth as in true *phæopus*.

Dimensions of the type (measured in the flesh):—

Head and body 135 millim.; tail (imperfect); hind foot

---

[*] Wiegm. Archiv, 1842, p. 357; Schr. Säug., Suppl. v. p. 121, pl. 10 (1855).

[†] Mon. Singes, p. 247 (1876)

(s. u.) 25; ear 16. Of another specimen with perfect tail—head and body 132; tail 90; hind foot 25; ear 16.

Skull: greatest length 30·5, basilar length 23·7; greatest breadth 16; nasals, length 11·8; interorbital breadth 5·9; palate length 13; palatal foramina 5·6 × 2·2; length of upper molar series 4·8.

Hab. Zaruma, Southern Ecuador. Alt. 1000 metres.

Type. Old female. B.M. no. 0. 2. 9. 44. Original number 380. Collected 14th June, 1899, by P. O. Simons. Eight specimens.

This animal varies considerably in colour, but the average tone is far paler and more olivaceous than in true *phæopus*, which is itself hardly as dark as the more northern subspecies *obscurior*, and the Central-American *chrysomelas*. It is the most southern representative of the *phæopus-chrysomelas* group, which is so distinct from true *Oryzomys* that I have thought it worthy of subgeneric distinction *, and have suggested for it the name of *Melanomys*, with *O. phæopus* as the the type.

Phyllotis boliviensis flavidior, subsp. n.

Size and proportions about as in the typical form, or the tail may average slightly longer. General colour buffy grey, the hairs of the back broadly tipped with dark brown. Under surface pale buffy white, the bases of the hairs slate. Yellow patches at anterior base of ears strongly marked; ears greyish, but the hairs of the inner surface also generally yellowish. Shoulders and forearms strongly washed with yellow, flanks with a marked yellow edging to the white of the lower surface, and rump suffused with yellow. Upper surface of hands white, of feet also white, but with their outer edge and a prominent patch on the end of the metatarsals deep yellowish. Tail with its under surface dull yellowish, at least terminally, often scarcely lighter than the upper surface.

Dimensions of the type (measured in flesh):—

Head and body 126 millim.; tail 95; hind foot (s. u.) 24; ear 26.

Skull: greatest length 30·5, basilar length 25·3; zygomatic breadth 16·8; nasals 12·2 × 4·1; interorbital breadth 4; diastema 8·2; palatal foramina 7·2 × 3·1; length of upper molar series 5·6.

Hab. Bateas, Caylloma, Peru. Altitude 4500 m.

Type. Female. B.M. no. 2. 7. 2. 5. Collected 19th May,

---

* Novitates Zool. 1902.

1901, and presented by Mr. Bernard Hunt. Twelve specimens examined from Caylloma (*Hunt and Simons*) and five from Titiri (*J. Kalinowski*).

An examination of the series of *Phyllotis boliviensis* obtained by the late Mr. P. O. Simons at Potosi shows that these agree precisely with the type; and as Mr. Bridges is known to have collected at Potosi, that place may very well be considered as the typical locality. Other similar specimens were collected by Mr. Simons at Livichuco in the same region.

But the skins obtained by Messrs. Kalinowski, Hunt, and Simons in the Peruvian part of the plateau, at Caylloma and Titiri, are all noticeably more strongly suffused with yellow, the ears more yellow (especially internally), the shoulders and sides more yellow, the yellow patches on the metatarsals, often imperceptible in true *boliviensis*, always strongly marked, and the underside of the tail, white throughout and contrasted with the buffy or brownish upperside in *boliviensis*, is in *flavidior* either wholly or partly dull yellowish, and is often but little lighter than the upperside.

Coendou mexicanus yucataniæ, subsp. n.

General external characters as in true *C. mexicanus* of S. Mexico and Guatemala, except that the long black fur of the body is somewhat shorter and poorer, so that the spines are more or less visible through it, at least on the head, flanks, and limbs. In other respects I can find no external difference between the two forms.

Skull markedly swollen and weaker throughout than in true *C. mexicanus*. Nasals parallel-sided, not expanded anteriorly. Forehead much inflated, the highest point at the naso-frontal suture, vertically above the first true molar. Interorbital region smooth, convex, broadening posteriorly, where there are well-marked and considerably developed post-orbital inflations. Brain-case small and narrow. Anterior palate flat, not hollowed behind the palatal foramina. Bullæ high and narrow, well inflated.

Incisors weak and narrow. Cheek-teeth comparatively small. Premolar rather, but not conspicuously, larger than the molars.

Dimensions of the type (measured in skin):—

Head and body (c.) 440 millim.; tail (c.) 380; hind foot, s. u. 62, c. u. 74.

Skull: greatest length 88; basilar length 75; zygomatic breadth 48·5; nasals 30·5 × 19; height of forehead above palate 97; interorbital breadth, anteriorly 30, posteriorly 36;

breadth across brain-case just behind zygomata 33; palate length 38·5; diastema 25; palatal foramina 8 × 3·2; length of upper tooth-row 18·1; combined breadth of upper incisors 5·2.

Hab. Yucatan (probably near Izamal).

Type. Male. B.M. no. 91. 3. 24. 1. Collected by Dr. G. F. Gaumer.

While all the porcupines of this group are extremely similar externally, the skull-differences between individual specimens, even from the same place, are very great, and it is most puzzling to know what should be put down to individual variation and what to specific or subspecific distinction. But the very small size of this Yucatan skull (a Guatemalan one has the basilar length 8 millim. greater), its smooth even convexity above, the development of the inflated postorbital projections, and the small incisors and cheek-teeth induce me to think that this form of *C. mexicanus* should be distinguished by name. In any other group, having less variable skulls, the differences would be fully specific.

Cyclopes didactylus eva, subsp. n.

Size as usual. General colour of body comparatively dark, as in *C. d. ida* and true *didactylus*, not yellowish as in *C. d. dorsalis*. Face, forearms and hands, lower legs and feet strongly yellow, matching these parts in *C. d. dorsalis*. Shoulders and thighs not greyer than rest of body, but tending towards yellowish. Dorsal streak present, fairly well defined; sternal streak vague and ill defined, but rather variable in development. Under surface dull buffy, more or less suffused with fulvous; inner sides of arms and legs dull yellow. Tail yellow, becoming bright golden yellow at its tip.

Dimensions of the type (measured in the flesh):—

Head and body 200 millim.; tail 206; hind foot 31; ear 13.

Skull: greatest length 50; interorbital breadth 11; breadth of brain-case 23; palate length 20.

Hab. of type. Rio Tapayo, N.W. Ecuador. Other specimens from Balzar Mts., W. Ecuador, and Bogota, Colombia.

Type. Old female. B.M. no. 2. 7. 26. 3. Collected 16th November, 1901.

This form is intermediate between the yellow *C. d. dorsalis* of Central America and the darker grey-limbed and grey-tailed *C. d. ida* and *didactylus*, having the greyish body of the two latter, with the yellow limbs and tail of the first named.

XXXVI.—*On the Panda of Sze-chuen.*
By Oldfield Thomas.

The Panda (*Ailurus fulgens*) was recorded from Sze-chuen, Western China, many years ago by M. Pousargues, but neither he nor any other author appears to have made a comparison between the Chinese and Himalayan specimens.

The British Museum now owes to the generosity of Mr. F. W. Styan a fine example of the Sze-chuen Panda, and on comparing its skull with a series from Nepal and Sikim, I find that it is so much larger as to deserve subspecific distinction.

In honour of its donor, to whom we owe so large a proportion of our Chinese collection, I propose to call it

Ailurus fulgens Styani, subsp. n.

Colour and proportions very much as in the true *fulgens*, although the anterior back is less noticeably darker than the middle back, the back of the ears is less conspicuously black, and there is rather less white on the cheeks and round the eyes. But I doubt if any of these differences will prove constant, as the Himalayan specimens vary in all of them.

Skull conspicuously larger than in *A. fulgens*, and especially far more inflated in the frontal region. While the frontal profile in *fulgens*, from nasal to vertex, is only slightly convex, in *Styani* it is conspicuously swollen, owing to the large frontal sinuses; thus in *Styani* the measurement, taken with callipers, from the hinder part of the palate to the most prominent part of the forehead is no less than 46 millim., while in *fulgens* it is only about 37. Brain-case more swollen anteriorly in *Styani*, so that the outline, as viewed from above, is more parallel-sided, instead of the even contraction forwards found in *A. fulgens*. Zygomata stout and strong, widely spreading; continued backwards above the meatus as a broad upcurved ledge, far more developed than in *fulgens*. Posterior palate broad, the posterior nares widely open. Bullæ low and flat, but little inflated. Lower jaw with the coronoid process very large, broadly spatulate, higher, broader above, and narrower below than in *fulgens*.

Teeth large and powerful throughout. Upper anterior premolar large, triangular, with a large internal process.

Dimensions of the type (measured in skin):—

Head and body 610 millim.; tail 405; hind foot (s. u.) (wet) 112; ear (wet) 60.

Skull: greatest length 115; basal length 98; zygomatic breadth 88; interorbital breadth 31; palate length from gnathion 54; breadth of posterior palate 13·3; lower jaw, top of coronoid to lower side of angular process 55; coronoid, height from level of condyle 28·5, breadth at same point 17·5. Teeth: combined breadth of upper incisors 15, combined length of upper cheek-teeth 37.

Hab. of type. Yang-liu-pa, N.W. Sze-chuen.

Type. Old male. B.M. no. 2. 6. 10. 41. Killed 14th June, 1897. Presented by F. W. Styan, Esq.

The large size of the head, and especially the greatly swollen forehead, makes the skull of this animal look very different to the comparatively flattened skull of *A. fulgens.* But although at least two are old, yet none of our Himalayan skulls are quite so old as the Sze-chuen one; and on this account I do not venture to distinguish Mr. Styan's animal as a separate species, on the chance that intergradations may occur, and older specimens of the Himalayan Panda show some tendency to the swollen character of the skull of *Styani.*

XXXVII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXIII. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plate VI.]

1. Further Note on abnormally-coloured Plaice (a specimen with white spots).
2. On the Example of *Regalecus glesne*, Ascan., in the Museum of the University.
3. On Sharks &c. captured in Nets at St. Andrews.
4. On British *Nereidæ* and *Staurocephalidæ*.
5. On the *Nereidæ* of the 'Porcupine' Expedition.
6. On Canadian *Nereidæ* dredged by Dr. Whiteaves in the Gulf of St. Lawrence.
7. On Norwegian *Nereidæ* collected by Canon Norman, D.C.L. &c.

1. *Further Note on abnormally-coloured Plaice (a specimen with white spots).*

This example is considerably larger than the peculiarly-pigmented or piebald forms described in the last note. It measures 17 inches in length and fully 9 inches in breadth. The ground-colour of the dorsum and the white under (left) surface are normal, and the external structure presents no peculiarity. Instead of the ordinary red spots on the dorsum,

a series of pure white spots, some of them larger than a sixpence, had taken their places. The largest spots, which often were not quite circular, were dotted irregularly over the anterior two-thirds, whilst a distinct series about three-quarters of an inch apart, and chiefly in a single row like the ordinary red, occurred along both dorsal and anal fins. On the narrow part of the body in front of the caudal the spots were smaller and nearer each other: none extended to the caudal fin. The specimen was well nourished and had evidently escaped the dangers usually associated with conspicuous abnormality of coloration until it came in the way of the undiscriminating methods of man.

2. *On the Example of* Regalecus glesne, *Ascanius, in the Museum of the University.*

In Day's 'British Fishes' various instances of the occurrence of this fish (his *Regalecus Banksii*) are noticed, and amongst them is one, on August 21st, 1880, "12 feet 9 inches long, which was found dead, but quite fresh and uninjured, at the mouth of the Eden, on the sands at St. Andrews." This specimen has been stuffed and is now in the University Museum. The author, however, had overlooked another example which was stranded on the West Rocks, St. Andrews, in April, 1861, and an account of which was given by Robert Walker*, who apparently was unaware of a previous structural account of a specimen by Hancock and Embleton †.

So far as can be ascertained, the example in the University Museum was caught in the salmon stake-nets off Tents' Moor, on the further bank of the Eden—that is, on the stretch of sand between the rivers Eden and Tay. It was alive when captured and came into the hands of the authorities then in charge of the Museum in a perfectly fresh state. Unfortunately no attempt seems to have been made to give a minute account of its external appearance, to determine the sex and the condition of the internal organs, or to see that the taxidermist in Dundee followed nature. The result is that instead of a companion-account to Prof. John Reid's *Trachypterus arcticus* ‡ (his *T. vogmarus*) there is only an inaccurately mounted skin as a record of one of the most perfect examples of the species procured in this country. The total length is 12 feet, yet, according to Day, it was 12 feet 9 inches when fresh. This reduction may have been due to the abnormal breadth (5¼ inches) given to the body by the taxidermist, as shown by contrasting it with the section of an example from Stonehaven kindly presented by the late Sir John Struthers. Moreover, the 10–15 long (occipital) rays of the dorsal fin are absent or represented by a haphazard series of short artificial rays, and those of the fin behind are also artificial and placed bolt upright, besides being both too short and too flat. They should, of course, slope backwards. Day gives the number of the dorsal fin-rays at $\frac{10}{220}-\frac{15}{290}$, whilst in the 'Scandinavian Fishes'* the condition is $\frac{10}{200}-\frac{15}{400}$. In the specimen in the St. Andrews Museum the rays are 294 in number, the last four being so strong and thick as to resemble offensive weapons, a feature probably due to a misapprehension. The pectoral fins have the correct number of rays (11). The pelvic fins appear to be wholly artificial, and have a spatula-like symmetrical tip at the end of a smooth ray, and thus differ from the figure in the 'Scandinavian Fishes,' which shows a triangular trilobate tip and a dermal flap on the inner side of the ray about the commencement of the terminal third.

---

* Ann. & Mag. Nat. Hist. ser. 3, x. p. 1 (July 1862).

† Ibid. ser. 2, iv. p. 1, pls. i. & ii. (1848).

‡ Ann. & Mag. Nat. Hist. ser. 2, vol. iii. p. 456 (1849).

3. *On Sharks &c. captured in Nets at St. Andrews.*

The use of gill-nets for the capture of cod and pleuronectids, as well as the employment of trawls, has shown that many an inhabitant of the sea—of whose presence we have hitherto had slight acquaintance—approaches the inshore waters at certain seasons, or is found at various times roaming in the offshore, like the fox-shark (*Alopias vulpes*) of 14 feet caught in a trawl off the Forth, the stomach of which was filled with half a bushel of another somewhat uncommon form, viz. *Belone vulgaris*. The gill-nets recently used in St. Andrews Bay produced last winter at least five examples of the Porbeagle shark (*Isurus cornubicus*), of which only one was a male, and ranging from 7 to 9 feet. This fish, therefore, is by no means uncommon off the eastern coasts, as, indeed, its capture by liners and by salmon stake-nets indicated formerly. The contents of their stomachs usually consisted of the remains of Gadoids, lenses especially being conspicuous in the pulp after digestion. In one instance 11 hooks with the hair "snood" attached occurred, the shark having passed along the fisherman's line and removed the haddocks and other fishes by biting the snood. The hooks appear to give no inconvenience in the stomach, and are probably ejected by the mouth. This species, from its swiftness, strength, and the nature of its teeth, would seem to be capable of doing considerable injury to large forms, but there is no history of its attacking man in British waters. The muscles of both this and the fox-shark form excellent food, the flavour of the latter especially resembling lobster, so that each was successfully used for a students' dinner to 80 or 100 men.

---

* 2nd edit., Smitt, 1893, i. p. 322.

Besides the foregoing forms several examples of the tope and picked dog-fish, numerous porpoises and skate, a young sturgeon, various rare bony fishes, many diving birds, and a seal were procured in the gill-nets.

When the sperm-whales find multitudes of cuttlefishes unknown to man in the recesses of the Pacific and the "dolphins" (Coryphænoids) in the same and other oceans; when sharks fall on shoals of such fishes as the green bone, whose presence is rarely or ever revealed by any mode of fishing in the sea; and when any new method of fishing (in waters which have been harassed for hundreds of years) produces numerous forms whose presence was wholly unsuspected—it is well to approach the question of the "impoverishment of the sea" with caution. It cannot be doubted that constant interference renders the surviving marine fishes much more wary, and they are very capable of eluding any method of fishing.

4. *On British* Nereidæ *and* Staurocephalidæ.

In Dr. Johnston's 'Catalogue of the Annelids in the British Museum' four species of Nereids are recorded; but, as the author himself remarks, re-examination of several is necessary, indeed about half the number therein described would appear to be synonymous. Thus his *Nereis brevimana* appears to be *N. diversicolor*, *Nereis cerulæa* = *N. cultrifera* (excl. syn.), *Nereis fimbriata* = *N. pelagica*, *Nereis imbecillis* = *Nereilepas fucata*, and what *Nereis pulsatoria* refers to is uncertain.

Heteronereis lobulata = *N. cultrifera* (excl. syn.), *Heteronereis renalis* and *Heteronereis margaritacea* = *Nereilepas fucata*, and *H. signata*, Baird, is probably one of the foregoing.

The Nereids are so generally distributed and so readily recognized that for a long time they have been well known to marine zoologists, and therefore recent researches have not increased their number to any noteworthy degree. No species new to science, so far as can be ascertained, has been recorded from the British area. The relationships of the Heteronereids of the various species, however, have been more satisfactorily made out since the labours of Ehlers and Claparède enriched the subject. The complexity, in the case of such species as *Nereis Dumerilii*, is sufficiently known, though perhaps it is less difficult to distinguish the various forms in this species than in others. Most of the Nereids frequent tubes of one kind or other.

At St. Andrews the cosmopolitan *Nereis pelagica* appears to show a heteronereid condition only in the male, the female, however, having a special coloration at the breeding-season; yet Ehlers records a heteronereid female. No finer examples of this species have been found than at St. Andrews, though it ranges from Greenland to Japan. Those from the Channel Islands are smaller than those in the north. The *Nereis cultrifera* of Grube is very generally distributed both on the eastern shores of Scotland and in the south, as at Plymouth, Polperro, and the Channel Islands. Its value as bait causes it to be more readily observed. The epitocous condition is not frequent.

It is long since *Nereis irrorata*, Malmgren, was procured in the Channel Islands (1868), and, as shown in the collection of the British Museum, at Polperro and elsewhere, and Mr. Allen finds it plentiful at Plymouth. *Nereis Marionii*, Aud. & Ed., is also a strictly southern form, occurring on the shores of France and the Channel Islands. It does not seem to have been procured at Plymouth.

No more conspicuous species occurs in the south than *Nereis Dumerilii*, Aud. & Ed., and it is also abundant in the west as well as not infrequent in the east. A species which, in its ordinary form, presents the separate sexes, which may be hermaphrodite, or shows the pelagic transformation in both sexes, cannot be otherwise than conspicuous, especially in the laminarian region and deeper water.

Nereis diversicolor, O. F. Müller, again, is abundant on various parts of the coast—from the northern to the southern shores—frequenting clayey mud, peat, and other media—often in brackish water.

A large species, *Nereis longissima*, Johnston, has a wide distribution—ranging from Shetland to the southern shores of England, and to a depth of 1366 fathoms off the west of Ireland (Ehlers, 'Porcupine,' 1869), as well as in shallow water in the Bay of Tunis in the 'Porcupine' Expedition of 1870. The southern forms differ in tint from the northern, as also does that from the Bay of Tunis. A more important point, however, is the occurrence of heterogomph bristles at the inferior border of the upper series of bristles in the foot. These, apparently, had hitherto been overlooked.

It is curious that so conspicuous a form as *Nereis virens*, Sars, should have escaped the persevering efforts of Dr. George Johnston; yet this species is the giant of the family, if not of the order—large specimens measuring fully 3 feet, with a breadth of 1¾ in. across the body and feet. It is found at various parts of the coast both east and west, often in muddy sand, and very large examples are common on the beach at St. Andrews after storms in April, May, and October. It is a favourite bait in line-fishing.

The last of the British Nereids is *Nereilepas fucata*, Savigny, a form very abundant in deep water off the eastern shores, and in the stomach of the cod and haddock. It is frequently commensalistic with *Pagurus Bernhardus* in *Buccinum* and *Fusus*.

The British Staurocephalidæ, a group which Ehlers regards as falling under his *Eunicea prionognatha*, have hitherto been chiefly conspicuous by their absence from faunistic lists. One species, however, viz. *Staurocephalus rubrovittatus*, Grube *, was not uncommon in 1868 on the under surfaces of stones near low-water mark, and under the larger stones in pools, at Herm. Its beautiful carmine bands and graceful outlines, as well as its active *Hesione*-like movements, make it a striking form. *Staurocephalus Kefersteini*, M'Intosh †, again occurred under stones near low-water mark at Lochmaddy, North Uist, in 1865, and also subsequently, in 3–4 fathoms, in Loch Portan, an inland sea on the same island.

A third species was met with under stones between tide-marks at St. Peter Port, Guernsey, in July. Its pale lavender colour, with a median dorsal yellow belt bounded by a red vessel on each side, the structure of its dental apparatus, its curious strong bristles with dilated bifid tips, and other features at once distinguish it. Though it approaches the *Staurocephalus Chiajii* of Claparède it is probably distinct from it.

A fourth species procured in a trammel net off Fermain Bay, Guernsey, has a head furnished with four red eyes and an elongated body, as in *Staurocephalus Kefersteini*, but of a pale yellow hue with a white line from the middle of the dorsum at the proboscis backwards, the line becoming double posteriorly. In the minute structure of the feet this form approaches *S. Kefersteini* except in certain details.

The last of the group is *Ophryotrocha puerilis*, Claparède, a species formerly described as *Staurocephalus Siberti* ‡, and which occurs abundantly on the oyster-beds at Whitstable, and is readily kept in a small aquarium, where it freely multiplies.

---

* Arch. f. Naturgesch. 1855, p. 97.

† Trans. R. S. E. xxv. pt. ii. p. 417, pl. xvi. fig. 11.

‡ Ann. & Mag. Nat. Hist. ser. 5, xvi. p. 482, pl. xiii. figs. 5–8.

5. *On the* Nereidæ *of the 'Porcupine' Expedition,* 1870.

Only a single example occurred, viz., a small male of *Nereis Dumerilii*, Aud. & Ed., in 30 fathoms in Tangiers Bay.

6. *On Canadian* Nereidæ *dredged by Dr. Whiteaves in the Gulf of St. Lawrence.*

Only two species of this family were obtained, viz., *Nereis pelagica*, L., and *Ceratocephala* near *Loveni*, Malmgren. The former widely distributed species occurred in considerable numbers, though none were beyond medium size, especially from Station 53 (Egmont Bank, a small rocky patch to the north-east of Shediac Bay, in 10 fathoms), 1873, and again from Orphan Bank, Gulf of St. Lawrence, and at Stations nos. 46–48 (near Prince Edward Island). The specimens present no structural variation.

Ceratocephala near *Loveni*, Malmgren.

One example was in all probability procured in 1872 in the deep water (313 fathoms) between the east end of Anticosti and the Bird Rocks, though no station is marked on the bottle.

In 1873 another was obtained at Station 7, in the deep water (110–220 fathoms) between Anticosti and the Gaspé Peninsula.

The single species of *Ceratocephala* hitherto known is characterized, amongst other things, according to Malmgren, the originator of the genus, by the uniform condition of the feet: "Pedes per totum corpus fere eadem forma"; whereas the form now described is distinguished by the reverse, the feet in the middle or anterior part of the median region having the dorsal cirri so greatly developed as to form a characteristic feature. As, however, this may be a sexual variation, further investigation is required.

The two examples are small, neither exceeding half an inch in length, and both are imperfect, about 24 bristled segments in each case being present. One, however, was larger than the other.

The head (Pl. VI. fig. 1) is of moderate size, and has a median fissure in front, from which a groove passes to its posterior border. The tentacles are subulate organs, rather filiform at the tip. The palpi are somewhat small, but have the normal position, the distal region in each bearing a tapering conical process, so different from the usual bulbous termination in the ordinary Nereids. No eyes are visible. The tentacular cirri are proportionally slender, and the longest is the dorsal of the first pair, not the dorsal of the second pair, as in the ordinary Nereids. The proboscis is armed with a pair of amber-coloured jaws, having slender points and about eleven teeth (Malmgren). No paragnathi are present, but the basal segment of the organ in extrusion has a series of conical papillæ ranged entirely round the distal region, and, as Malmgren points out, not in a uniform line.

The first foot has a tapering dorsal cirrus, which extends beyond the other parts. The dorsal lobe is little developed. The setigerous region ends in a conical papilla behind that for the spine, and bears a single brown spine and a series of homogomph bristles, the terminal process of which has a dilatation with longer spines near the base. The ventral lobe is a short conical process. The ventral cirrus is of considerable size, and only one appears to be present on this foot; indeed, the specimen did not show the double cirrus till the fifth or sixth foot, but this may have been due to injury.

The third foot has the prominent conical ceratophore (of the long subulate dorsal cirrus), with a broad base to the inner side of the dorsal lobe, which is subulate. An upper setigerous lobe appears on this foot, with a small brown spine and a small tuft of bristles. The inferior setigerous lobe has its terminal papilla posteriorly and two considerable tufts of bristles. The ventral lobe is conical with a large basal region.

All the bristles (Pl. VI. fig. 4) have the same structure, namely, a cylindrical translucent shaft with very regularly arranged cameræ and a dilated distal end, which does not taper to a point inferiorly, but forms a rounded cup-shaped outline. The terminal piece is curved, dilated at the base, where the spines on the edge are longer, and tapers to a fine point; the inferior articulating process is comparatively short, leaving a portion of the socket free.

The fourth and fifth feet appear to have only a single ventral cirrus, which is placed close to the body, a long interval occurring between it and the ventral lobe. The sixth foot has two ventral cirri. The great proportional size of the bristles[1] in such a foot is a feature, and they have a peculiar pale golden sheen. The upper spine is the smaller, and the bristles pass off in two bundles above and below it. The inferior spine likewise divides the bristles of its lobe into two divisions, both of which are larger than in the upper groups; the only differentiation of these bristles is that the dorsal are more slender and have the longest and most delicate terminal pieces, whilst the ventral have stronger shafts, broader and shorter terminal pieces, and larger spines on the edge. At the ventral edge of this series the terminal pieces are somewhat shorter. This form of foot is represented in the seventh (Pl. VI. fig. 2).

The tenth foot shows a notable increase in the size of the ceratophore of the dorsal cirrus, and whilst the foot is proportionally shorter, the dorsal and ventral lobes are larger and longer. On the eleventh foot the ceratophore has nearly doubled its length, so that it is not much shorter than the long—almost filiform—cirrus projecting from its tip. The dorsal and ventral lobes have also increased in size.

At the fourteenth foot (Pl. VI. fig. 3) the great development of the ceratophore of the dorsal cirrus is evident, the slender cirrus projecting from a basal region which is longer than itself. Both specimens agree in respect to this region, and, as no sexual elements are visible, it would appear to be unconnected with the ripe condition, and, so far as known, with sex; yet it is well to wait for more complete specimens before deciding the question of species.

This genus was established by Malmgren * in 1867 for a species obtained by the distinguished Swedish zoologist, Sven Lovén, on the shores of his country.

It has not been thought necessary at present to do more than indicate the differences between these imperfect examples and the European form.

7. *On the Norwegian* Nereidæ *collected by Canon Norman, D.C.L. &c.*

Three common species were dredged, viz., *Nereis pelagica*, *N. Dumerilii*, and *N. diversicolor*.

EXPLANATION OF PLATE VI.

Fig. 1. Head and anterior segments of *Ceratocephala* near *Loveni*, Malmgren, Gulf of St. Lawrence, Canada. Enlarged.
Fig. 2. Seventh foot of the foregoing. Magnified.
Fig. 3. Fourteenth foot. Similarly magnified.
Fig. 4. Bristle of *Ceratocephala*. × Zeiss oc. 2, obj. D.

XXXVIII.—*List of the Fishes collected by Mr. W. L. S. Loat at Gondokoro.* By G. A. Boulenger, F.R.S.

The Survey of the Fishes of the Nile, undertaken by the Egyptian Government in response to the appeal of the late Dr. John Anderson in 1899, has recently been extended into

---

* 'Annulata Polychæta,' p. 176.

the Uganda Protectorate, arrangements having been made for Mr. W. L. S. Loat, the Superintendent of the Survey, to spend a few weeks at Gondokoro. No attention had been paid to the fishes of that district since the expedition of Mr. and Mrs. Petherick in 1863, on which occasion Dr. J. Murie made a small collection which has been described by Dr. Günther *.

Mr. Loat's stay at Gondokoro lasted from the beginning of January 1902 to the end of March, during which period, in spite of severe illness, he was able to bring together some three hundred specimens of fishes, referable to thirty-nine species, a small number as compared to those obtained at other points on the White Nile. But he informs me that Gondokoro is a most unsatisfactory place to fish at, and that the same is true of the station of Lado on the opposite bank of the Nile, according to the statement of the officers of the Congo Free State, whose experience extends to other periods of the year. In fact they derive very little benefit from the fishes for their subsistence, owing to the difficulty of procuring them and to the insipid nature of the flesh of most of the kinds which occur there, the Bolti (*Tilapia nilotica*) and the Nile Perch (*Lates niloticus*) being the only exceptions. Although I believe instructions were issued from headquarters in Brussels to preserve fishes, if possible, for transmission to the Congo Museum, the Belgian officers have so far been unable to do anything to assist in this branch of natural history.

The collection made by Mr. Loat is therefore one of great value for the study of the distribution of the Nile fishes, even if not realizing the hopes that were entertained at the outset of the expedition; and it is not quite deficient in novelties, since it contains the type of a new Cichlid fish of the genus *Paratilapia*, a genus not previously known to be represented in the Nile, although occurring in Lake Victoria. This new fish is named *Paratilapia Wingatii*, after the Sirdar, Sir Reginald Wingate, to whose assistance, so kindly granted to Mr. Loat on his journey through the Soudan, the success of this part of the Nile Fish-Survey is in no small measure due.

---

* Petherick's 'Travels in Central Africa,' ii., Appendix C (1869).—Gondokoro is the southernmost locality at which fishes were obtained by the Petherick expedition. Dr. Günther states (p. 201) that Mr. Petherick collected "on an affluent of the White Nile (B. il Gazal and Djoor) south of Gondokoro." This is evidently a slip, the Bahr el Ghazal and its upper range, the Djoor or Jur, is, as correctly shown on Petherick's own map in the first volume of the work, *north*, and not south, of Gondokoro. The fishes brought home from Gondokoro belong to the following species:—*Clarias lazera*, C. & V.; *Schilbe mystus*, L. (*S. dispila*, Gthr.); *Mochocus niloticus*, Joann. (*Rhinoglanis typus*, Gthr.); *Ophiocephalus obscurus*, Gthr.; and *Anabas Petherici*, Gthr.

Unless otherwise stated, the fish mentioned in the following list were caught in the White Nile itself. Examples of four species were obtained from a large lake, name unknown, in the forest about 6 miles N.E. of Gondokoro.

Polypteridæ.

1. *Polypterus bichir*, Geoffr.

2. *Polypterus Endlicheri*, Heck.

3. *Polypterus senegalus*, Cuv.

This is the only common species of the genus at Gondokoro, the two others being rare.

Mormyridæ.

4. *Marcusenius Isidori*, C. & V.

5. *Gnathonemus cyprinoides*, L.

From the lake.

6. *Hyperopisus bebe*, Lacep.

Also from the lake.

7. *Mormyrus Hasselquistii*, C. & V.

Characinidæ.

8. *Hydrocyon Forskalii*, Cuv.

9. *Hydrocyon lineatus*, Blkr.

10. *Alestes dentex*, Hasselq.

11. *Alestes baremose*, Joannis.

12. *Alestes nurse*, Rüpp.

13. *Alestes macrolepidotus*, C. & V.

14. *Micralestes acutidens*, Ptrs.

15. *Distichodus brevipinnis*, Gthr.

16. *Nannocharax niloticus*, Joannis.

17. *Citharinus latus*, M. & T.

Cyprinidæ.

18. *Labeo coubie*, Rüpp.

19. *Barbus perince*, Rüpp.

20. *Barbus camptacanthus*, Blkr.

21. *Barilius niloticus*, Joannis.

22. *Barilius Loati*, Blgr.

Found abundant in running water.

23. *Chelæthiops bibie*, Joannis.

Several specimens were obtained, together with *Barilius niloticus*, *Nannocharax niloticus*, and *Mochocus niloticus*.

Siluridæ.

24. *Clarias lazera*, C. & V.

25. *Schilbe mystus*, C. & V.

From the lake.

26. *Clarotes laticeps*, Rüpp.

27. *Chrysichthys auratus*, Geoffr.

28. *Auchenoglanis biscutatus*, Geoffr.

29. *Auchenoglanis occidentalis*, C. & V.

Two species have been confounded under the name of *A. biscutatus*, both occurring in the Nile and the Senegal. *A. occidentalis*, to which the Chartoum specimens of Petherick's collection belong, differs in the longer snout (longer than the rest of the head), the shorter maxillary barbel (not extending beyond the centre of the eye), and the dark spots on the fins, if present, larger and separated by a network of the ground-colour. *A. biscutatus* was by far the commoner of the two at Gondokoro.

30. *Synodontis schall*, Bl. Schn.

31. *Synodontis frontosus*, Vaill.

32. *Synodontis batensoda*, Rüpp.

From the lake.

33. *Mochocus niloticus*, Joannis.

Cichlidæ.

34. *Hemichromis bimaculatus*, Gill.

35. *Paratilapia Wingatii*, sp. n.

Depth of body equal to length of head, 3 times in total length. Snout with slightly convex profile, as long as the eye, which is $3\frac{1}{2}$ times in length of head and slightly exceeds interorbital width; maxillary extending to below anterior border of eye; two series of minute teeth in each jaw, and an outer series of much larger ones; 4 series of scales on the cheek; large scales on the opercle. Gill-rakers very short, 9 on lower part of anterior arch. Dorsal XIV 10; spines increasing in length to the last, which measures nearly half length of head; soft portion pointed, the longest ray $\frac{3}{4}$ length of head. Pectoral obtusely pointed, $\frac{2}{3}$ length of head. Ventral produced into a filament, extending beyond origin of anal. Anal III 6; third spine as long as and stronger than last dorsal. Caudal rounded. Caudal peduncle a little longer than deep. Scales strongly ctenoid, 31 $\frac{3}{11}$; lateral line $\frac{20}{9}$. Pale brown, with iridescent gloss, and five dark brown bars on the body; three horizontally elongate blackish-brown spots on each side, the first from the eye to above the axil, involving a steel-blue opercular spot, the second on the lower lateral line below the last dorsal rays, the third at the base of the caudal fin; a vertical blackish-brown bar below the eye; dorsal fin greyish brown, bright orange at the base, with blackish spots at the base of some of the spines; anal greyish, with three darker light-edged ocelli on the soft rays; ventrals yellow, with the outer rays bluish black; caudal greyish, with rather indistinct crowded darker spots.

Total length 60 millim.

A single specimen was obtained on the 10th March with other small fish from the river. In spite of diligent search, Mr. Loat was not able to secure further examples.

Paratilapia Bloyeti, Sauvage, from Usagara and Lake Kivu, appears to be the nearest ally of this new species.

36. *Tilapia nilotica*, L.

As in the specimens previously collected by Mr. Loat in the White and Blue Niles, the parent carrying the eggs or young in the mouth and pharynx is invariably the female. I have examined over thirty such nursing individuals from Mr. Loat's collection, measuring from $3\frac{1}{2}$ inches to about a foot.

37. *Tilapia galilæa*, Hasselq.

38. *Tilapia Zillii*, Gerv.

Tetrodontidæ.

39. *Tetrodon fahaka*, Hasselq.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 58. OCTOBER 1902.

XXXIX.—*On new Species of* Histeridæ *and Notices of others*. By G. Lewis, F.L.S.

[Concluded from p. 239.]

Eretmotus major, sp. n.

Orbicularis, convexus, niger, nitidus; fronte tenuiter rugoso-punctata; pronoto læviter punctulato; prosterno basi subtiliter punctulato, striis sinuatis; mesosterno antice late arcuato marginatoque.

L. 3½ mill.

Orbicular, convex, black and shining; the head feebly impressed with shallow rugose punctures, some confluent in the median area, but this sculpture disappears at the sides, the lateral carinæ are not strong; the thorax, anterior angles are obtuse and very similar to those of *E. corpulentus*, Lew., surface finely punctulate; the elytra, striæ, inner humeral carinate and complete, 1 and 3 dorsal are basal and do not reach the middle, 2 longer and apparently reaching beyond the middle, all are fine; the pygidia are finely and evenly punctulate; the prosternum, anterior lobe transverse and narrow, and widely sinuous anteriorly, surface feebly and rugosely punctured, the striæ are rather fine and rather deeply sinuous at the coxæ, the base of the keel is only very finely and sparingly punctured, but two thirds of the anterior portion are distinctly punctured, the punctures seen under the microscope show fine central points; the mesosternum is widely arched like that figured for *E. corpulentus* (Ann. & Mag. N. H. 1892, x. p. 236, pl. xix. fig. 1), and the marginal stria closely follows the edge behind the prosternal keel only, surface finely punctulate, the suture is marked by a fine stria which does not meet in the middle, but it continues laterally halfway down the metasternum, the sternal pits are very wide and shallow, and their posterior limit is indicated by a feeble transverse elevation.

This species is most like *E. corpulentus*, but is larger.

Hab. Kabylia.

Eretmotus sinuaticollis, sp. n.

Orbicularis, convexus, niger, nitidus; fronte dense punctata; pronoto utrinque conspicue sinuato; prosterno striis anticis abbreviatis; mesosterno marginato, margine utrinque subtiliter striato; femoribus parce punctatis.

L. 2¾ mill.

Orbicular. convex, black and shining; the head rather densely punctate, lateral stria equally strong throughout its length; the thorax is anteriorly similarly and evenly punctate like the head, but posteriorly, especially before the scutellum, it is sparingly and finely punctured, it is markedly sinuous laterally, and the anterior angles are obliquely truncate; the elytra, inner humeral stria cariniform and complete, 1 dorsal very fine but traceable as complete, 2 more vague but apparently dimidiate, 3 obsolete; the pygidia are evenly and somewhat closely punctulate; the prosternum, the striæ are sinuous and shortened anteriorly, only occupying two thirds of the keel length, the anterior lobe and the anterior part of the keel are rather densely punctured, but the keel between the striæ is more densely and coarsely punctate; the mesosternum is bowed anteriorly, similarly to that figured for *E. sociator* ('Annals,' 1892, x. p. 236, pl. xix. fig. 4), with a clear marginal stria which follows the course of the edge, and on either side behind the coxæ on the marginal edge is a second fine stria, the marginal edge is punctulate, the foveæ are fairly deep; the femora are slightly punctured.

This species is most similar to *E. sociator*, but the prosternal striæ are shorter and the striation of the mesosternum is different.

Hab. Freudah, Algeria (*M. Maurice Pic*, No. 1).

Eretmotus cæsariensis, sp. n.

Orbicularis, convexus, niger, nitidus; fronte dense punctata; prosterno rugoso-punctato; mesosterno stria marginali arcuata; femoribus conspicue punctatis.
L. 2½ mill.

Orbicular, convex, black and shining; antennæ and legs piceous; the head, forehead flat, lateral striæ cariniform, surface somewhat opaque and closely punctured, punctures most dense and somewhat rugose near the eyes; the thorax, anterior angles obliquely truncate, densely punctured behind the anterior angles and along the border behind the neck, and some of the points are ocellate, even on the disk the punctures although smaller are close together; the elytra, outer humeral stria is carinate, particularly at its base, and it extends beyond the middle and posteriorly nearly touches the inner humeral, the latter is complete and markedly cariniform at the base, but fine posteriorly, 1 dorsal very fine, but is traceable as complete, 2 fine and dimidiate, 3 obsolete, surface finely and sparingly punctulate, some of the points are aciculate; the pygidia are evenly but not densely punctulate; the prosternum is densely and somewhat rugosely punctate, some of the points being confluent, the striæ are widely sinuous and are evanescent, or obliterated by the density of the sculpture, before the suture; the mesosternum is prominent, and the stria behind it is rather narrowly arcuate, the sternal foveæ are deep and nearly circular in outline; the femora are densely and conspicuously punctured.

This species is most similar to *E. Bedeli* in the form of the mesosternum, but the mesosternal stria is more arcuate, the femora are punctured and the prosternal keel rugosely punctured. In *E. Bedeli* the femora are smooth, and the punctures in the keel free of rugosities. *E. sociator* is somewhat similar also, but it differs from both *E. cæsariensis* and *Bedeli* in having the mesosternal outline and stria more widely arched, and also in its femora being less distinctly punctured.

Hab. Bou Berak, near Dellys, Algeria. Discovered by Dr. Chobaut, associated with *Aphanogaster testaceopilosa*.

Notodoma saturum, sp. n.

Globosum, rufo-castaneum, nitidum; fronte punctata, stria antice retrorsum acuminata; pronoto lateribus conspicue punctatis; elytris striis tenuiter impressis, 1, 2, 4 et suturali integris, 4 cum suturali basi arcuatim junctis, interstitiis parce et lævissime punctulatis; metasterno stria arcuata, crenulata; tibiis anticis 12-spinulosis.
L. 5 mill.

Globose, reddish brown and shining, with two pale blotches on the base of each elytron; the forehead is distinctly, rather closely, but not densely, punctate, the marginal stria is a little broken before the eyes, but is continued anteriorly and acuminately drawn back in the middle, the epistoma is finely punctulate; the thorax, marginal stria complete, there is a shallow fovea behind the anterior angles, and along the sides there is a border of rather large punctures, behind the neck the points are much finer and gradually become very fine on the region before the scutellum; the elytra, striæ, inner humeral shortened at the base, but apically joined to the sutural stria, 1, 2, 4, and sutural dorsal complete, the last two join at the base, there is no conspicuous punctuation on the elytra; the propygidium and pygidium are less closely and less distinctly punctured than the region behind the neck; the prosternum, keel with a few shallow punctures, lateral striæ feebly sinuous at the coxæ, but otherwise parallel to each other and a little shortened before the suture; the mesosternum, punctuation rather fine and sparse, marginal and transverse striæ complete and crenulate, the metasternal arched stria is also crenulate, but the crenulations are wider and less regular.

The large size of this species and the form of the frontal striæ are good distinguishing characters.

Hab. Tongking, "Montes Mouson, alt. 2000–3000 feet, in May" (*H. Fruhstorfer*).

Notodoma globatum, Mars.

Marseul states that this species has no prosternal striæ (Mon. p. 135), but I think this is an error, although the statement is practically repeated in the Annales Soc. Ent. Belg. p. 109 (1870). I have examples from Birma and Tenasserim, which have the thorax wholly punctured, and which in other respects agree with Marseul's description and figures of *N. globatum*, and in figure 1 *a* the striæ appear to exist.

Notodoma nigrum, sp. n.

Globosum, nigrum, nitidum; fronte stria antice valida; pronoto pone oculos impresso; elytris striis 1–4 et suturali integris, 5 basi abbreviata; antennis clava rufa; pedibus piceis, tibiis anticis spinulosis.

L. 2¼ mill.

Globose, black and shining; the head, forehead slightly concave anteriorly, over the anterior edge of each eye there is a small boss which interrupts the marginal stria, which otherwise is complete and strong, the surface is sparingly punctured; the thorax, the marginal stria is complete and crenulate behind the head, behind the eyes there is a longitudinal impression which occupies nearly half the thoracic length, surface somewhat evenly but not densely punctured; the elytra, striæ, inner humeral basal and dimidiate, 1–3 complete, 4 turns towards the sutural at the base, but does not quite join it, 5 is shortened before the base; the propygidium and pygidium are sparingly punctured; the prosternum, keel flat, widest at the base, and bordered with a stria which meets anteriorly; the mesosternum has two irregular marginal striæ which do not meet in the middle, the transverse stria is feebly bent and crenulate; the metasternum has a band of sparse shallow and irregular punctures in lieu of the arched crenulate stria seen in *N. fungorum*, Lew., and others; the first segment of the abdomen has a row of round punctures along its anterior edge, and the tarsi are relatively short for a species of *Notodoma*.

This species is remarkable for its colour, strong frontal stria, and short tarsi.

Hab. Palembang, Sumatra.

Phoxonotus lectus, sp. n.

Ovalis, convexus, brunneo-piceus, nitidus; fronte utrinque marginata, pronoto stria marginali integra, tuberculis 6 basi; elytris sutura elevata, 2 tuberculorum 3 lineis, striis 1 et subhumerali integris, 2–4 dimidiatis tenuibus; prosterno bistriato, striis divergentibus, in medio longitudinaliter tenuiter carinato; mesosterno sparse et minute punctulato.

L. 4 mill.

Oval, convex, piceous and shining; the head striate on either side, surface very finely pointed and also that of the thorax; the tubercles on the thorax and elytra, also the striæ on the latter, are fine, and correspond with those figured for *P. tuberculatus*, Mars.; the pygidia are finely and evenly punctured; the prosternum, anterior lobe is marginate and moderately expanded, keel rather broad and bistriate, striæ cariniform and widely divergent, and are rounded off anteriorly and continued along the edge of the lobe, the keel is longitudinally feebly carinate; the mesosternum is rather acutely pointed anteriorly, with a fine marginal stria which follows the course of the acumination, the sternal suture is marked by a feeble crenulate stria, crenulations wide and irregular, surface with a sparse and extremely fine punctuation; the metasternum has a band of shallow, often crescent-shaped, punctures across the middle, and there are fine points along the anterior and posterior borders; the first segment of the abdomen has a well-marked lateral stria and a band of crescent-shaped punctures along its anterior border, the other segments have fine transverse crenulate striæ; the tibiæ are formed like those figured by Marseul for *P. tuberculatus*.

The form of the prosternal striæ and the punctuation of the sternal plates will readily distinguish this species from *P. tuberculatus*, Mars. In Marseul's species the prosternal striæ are almost parallel, the keel longitudinally concave and the sternal plates wholly punctured.

Hab. Eastern Peru.

Phoxonotus Fryi, Lew.

Phoxonotus Fryi, Lew. Ent. M. M xvi. p 61 (1879).

Ovalis, convexus, piceus, nitidus; pronoto stria marginali integra, tuberculis 6 basi; elytris distincte punctatis, striis parum validis, 1 subintegra, 2–4 dimidiatis, 5 tuberculiformi; prosterno bistriato, striis antice connexis; mesosterno marginato in totum punctato. L. 4 mill.

Oval, convex, piceous and shining; the head marginate laterally, punctuation very fine; the thorax has four tubercles along its base, but the two anterior tubercles seen in *P. tuberculatus*, Mars., are almost obsolete; the elytra, both humeral striæ are complete, 1 dorsal almost complete, 2–4 dimidiate, 5 represented by three carinate tubercles, all the dorsal striæ are strong and well-marked as compared with the last species; the pygidia are finely and evenly, not densely punctured; the prosternum faintly raised longitudinally in the middle, with the lateral striæ very fine at the base and gradually but slightly divergent and cariniform from the coxæ forwards and angular anteriorly and continuous along the edge of the lobe, anterior lobe truncate with a feeble sinuous edge; the mesosternum is marginate and sharply pointed anteriorly, the surface is clearly and evenly but not densely punctate, punctures somewhat large and shallow, the transverse stria is straight and crenulate, crenulations (19–20) close and even; the metasternum has a band of larger but similar punctures along its base, the points lessen in size anteriorly till they become very fine behind the crenulate stria; the first segment of the abdomen is somewhat similarly punctured, but the finest points are on the median area; the anterior tibiæ are very similar to those of *P. lectus*.

The straight crenulate stria at the suture of the mesosternum is a marked character of this species and also that the prosternal stria has an angular course anteriorly, not rounded off as in *P. lectus* and *tuberculatus*.

Hab. Rio Janeiro (*Fry*).

Reninus turritus, sp. n.

Breviter ovatus, convexus, piceus, nitidus; fronte lateribus carinato-striata, clypeo truncato marginato; pronoto basi bicarinato; elytris striis humerali et 1–4 integris, carinatis, suturali tuberculiformi; mesosterno in medio transversim bistriato; tibiis valde dilatatis. L. 3½ mill.

Shortly oval, convex, piceous, shining; the head with a cariniform lateral stria, the epistoma with a few fine irregular transverse striæ, clypeus truncate with the edge distinctly raised; the thorax smooth, marginal stria complete, anterior angles a little oblique, on either side at the base opposite the third elytral stria is a somewhat oblique fine carina which does not quite reach to the middle of the disk; the elytra, striæ, inner humeral carinate and complete, 1–4 also complete but less carinate, especially the fourth, 5 wanting, sutural tuberculiform, tubercles seven and one basal close to the scutellum; the propygidium is finely, transversely, and irregularly strigous except at the apex; the pygidium is almost without sculpture; the prosternum, surface microscopically densely strigose, the anterior lobe is widely expanded and marginate, the keel has two median striæ which widen out widely at the base, where they join the lateral striæ, anteriorly the median striæ join before the middle, the two lateral striæ are broken or branched anteriorly; the mesosternum is obtusely acuminate, the marginal stria is fine and does not follow the contour of the acumination, behind the marginal stria are two well-marked transverse striæ, the anterior one is widely bowed, the posterior one is nearly straight, the suture is sufficiently traceable to show its position; the metasternum has a straight lateral stria and three others outcurved beside it, near the centre there is a very minute tubercle; the first segment of the abdomen has three fine lateral striæ and some irregular scratches or striæ on each side of its base. The surfaces of all the sterna are impunctate; the tibiæ are all widely dilated and spinulose on their outer edges.

This species closely resembles *R. meticulosa*, Lew., in the thoracic carina and the tuberculate sutural stria. *R. Salvini*, Lew., has no sutural stria, and in *seminitens*, Sch., the sutural stria is punctiform and dimidiate. *R. meticulosa* has the clypeus sinuous at the edge, not truncate, and the epistoma is marked by irregular but distinct transverse striæ.

Hab. Para. One example in the British Museum.

Tryponæus cornifrons, sp. n.

Elongatus, cylindricus, niger, nitidus; rostro apice acuminato, bisulcato; fronte in medio conspicue tuberculata; pronoto antice depresso; elytris rufo-maculatis; propygidio pygidioque vix dense punctatis; prosterno mesosternoque bisulcatis; metasterno longitudinaliter in medio conspicue punctato; tibiis anticis 4-dentatis. L. 5½ mill.

Elongate, cylindrical, parallel laterally, black and shining; the head, rostrum acuminate and slightly reflexed at the apex, somewhat trigular and bisulcate on either side of a median carina, on the vertex is a large and conspicuous dentiform tubercle, the ocular tubercles are rather small and obtuse, behind the front tubercle are large shallow somewhat irregular punctures; the thorax behind the head is rounded off, depressed and punctured, the punctures are larger than those on the head but otherwise are similarly shallow and irregular, the other parts of the thorax are more clearly punctured but not thickly, especially near the scutellum, where the points are finer; the elytra are finely and rather sparingly punctulate, with a large lobe-shaped red spot, the spot does not touch the base and is rather more narrowly divided at the scutellum; the propygidium and pygidium are rather densely punctate, the latter being pilose and obtuse at the apex; the prosternum, the keel has the outline of an elongate triangle and a marginal stria which is not continued at the base; the mesosternum is obtuse anteriorly with two deep lateral sulci, the keel has a few scattered punctures; the metasternum has two short sinuous striæ which touch the anterior edge behind the middle of the mesosternal keel, there are no lateral striæ, but the surface has large and clear punctures, especially down the median area; the anterior tibiæ are 4-dentate and the tooth on the inner edge is very long and conspicuous.

This species may be placed near *T. pictus*, Mars., but it is parallel at the sides and the rostrum is formed like that of *T. spiniger*, Mars. I have not seen the female.

Hab. Jatahy, Province Goyas, Brazil (*E. Grounelle*).

Tryponæus bellator, sp. n.

Cylindricus, parum elongatus, niger, nitidus; fronte marginata, in medio carinata, rostro utrinque impresso; pronoto antice in medio excavato; prosterno parum late marginato; pygidio denso punctato; tibiis antice intus haud dentatis.

L. 4¾ mill.

Cylindrical, rather elongate, and robust, black and shining; the head, rostrum is rounded off at the apex, not reflexed (the figure for *T. luteiventris*, Mars. Mon. 1860, pl. 15. fig. 4, ♂, fairly represents the outline and impressions of the rostrum, but the apex in *bellator* is more rounded), there is a median rather broad and slightly raised carina with a lateral impression on either side, the impressions are widest between the eyes; the thorax is very finely and sparingly punctured on the disk, more distinctly laterally and rather densely behind the anterior angles, behind the neck there is a wide, somewhat triangular excavation, but it is rounded off posteriorly, and when viewed sideways the posterior edge is seen to be distinctly elevated; the elytra are more closely punctulate than the disk of the thorax; the propygidium and especially the pygidium are densely punctured, the latter is convex and a little pilose; the prosternum is parallel laterally, but very slightly widening at the base, the marginal stria meets anteriorly but does not continue round the base, laterally it leaves rather a wide margin; the mesosternum has an arched outline in front and an entire marginal stria; the metasternum has a narrow median canaliculation and is sparsely punctulate, the points are much clearer than those on the mesosternum, which are sparse and almost microscopical; the anterior tibiæ are 4–5-dentate and the interior edge is angulate at the base and not toothed.

This species must be placed near *T. bisulcifrons*, Mars.; the general outline, form of the head, and parallel prosternum are similar, but in *T. bisulcifrons* the prosternum is bordered with a narrow carinate stria.

Hab. Brazil, "São Paulo, val de Pardo" (*E. Grounelle*).

Coptostethus, gen. nov.

Gen. *Trypetico* forma similis. Corpus cylindricum, truncatum; pronotum parallelum; pygidium subconicum vel convexum; prosternum utrinque truncatum; mesosternum antice obtusum; tarsi omnes graciles.

The type I have taken for this genus is *Tryponæus proboscideus*, F.: the species have the facies of *Trypeticus* rather than *Tryponæus*; the prosternum has the shape of a parallelogram whose angles are all right angles. In *Tryponæus* the prosternum is widest at its base.

XYLONÆUS, gen. nov.

Genus *Tryponæo* forma similis. Corpus elongatum, cylindricum; pronotum parallelum; pygidium conicum (♂) vel compressum (♀); prosternum mesosternumque longitudinaliter sulcata; tarsi elongati, omnes gracillimi.

This genus is established to receive *Tryponæus bifidus*, Lew., the sterna of which are shown in the figure given in the Biologia Centr.-Amer., Coleopt. vol. ii. part 1, tab. 6. fig. 17. *T. fallax*, Mars., *filum*, Mars., *tuberculifrons*, Mars., *aculeatus*, Lew., and *columellaris*, Lew., must also be assigned to *Xylonæus*. My collection also contains some undescribed species of which I have only female examples—in all there are about 13 species.

Xylonæus immarginatus, sp. n.

Cylindricus, niger, nitidus; fronte tuberculata, rostro apice acuto, pronoto angulis anticis prominulis; prosterno longitudinaliter valde sulcato, lateribus haud marginato, in medio utrinque angulato-dilatato.

L. 4⅓ mill.

Cylindrical, black and shining; the head is impressed between the eyes, surface (and also that of the rostrum) microscopically strigose, with shallow scattered punctures, the base of the rostrum has a median somewhat compressed tubercle and in front of it a shallow oval excavation, the point of the rostrum is acute; the thorax when viewed from above is sinuous behind the eyes and the angles are somewhat obliquely prominent, surface clearly and rather strongly but not densely punctate, and there is an irregular narrow median space smooth; the elytra are less clearly punctured and the points are oval and closest along the sutural area; the propygidium and pygidium are punctured similarly to the thorax and the latter is rather acutely conical; the sterna are all clearly canaliculate longitudinally, but have no marginal striæ or sulci, the prosternum is angularly widened out in the middle and the surface is strigose rather than punctate; the mesosternum is distinctly and closely strigose; the metasternum is strigose in the region of the canaliculation and punctate laterally.

The remarkable form of the prosternum of this species is very dissimilar to any other known.

Hab. Brazil. "Et de São Paulo, Ribcirao pires" (*E. Grounelle*, November, 1898).

Trypeticus Grounellei, Mars., 1883.

This species belongs to a section of the genus in which the male has an asymmetrical rostrum; the terminal protuberance is largest on the left side. I have three other species which are similar in this respect, and I think *T. silvicola*, Sch., also belongs to this division, but the description is drawn up from the female, and I am therefore uncertain.

Teretriosoma festivum, Lew. Ent. M. M. xvi. p. 61 (1879).

Subcylindricum, viridi-cyaneum, metallicum, undique dense punctatum; antennarum clava rufa; fronte subdepressa, in medio lævi; elytris tuberculo subhumerali lævi; mesosterno antice immarginato; pygidio in medio transversim carinato; pedibus rufo-brunneis, tibiis anticis 6-dentatis.
L. 3-3½ mill.

The mesosternum is somewhat obscurely marginate at the sides, but not round the acumination, and the pygidium has the higher and lower parts divided by a very well-marked carina. This species is more quadrate in form than *T. facetum*, Lew., and in its general outline agrees with *T. immarginatum*, Lew.

I have two specimens of the above species from Jatahy, in the Province of Goyaz, which measure only 3 mill., but I cannot see any other difference. The type specimen came from Parana.

Teretriosoma prasinum, sp. n.

Cylindricum, cyaneo-viride, nitidum; capite basi triangulariter lævi; pronoto utrinque tenuiter foveolato; elytris basi transversim impressis; propygidio pygidioque dense et pariter punctatis; mesosterno utrinque marginato; pedibus rufis.
L. 2¼ mill.

Cylindrical, bluish green, shining; the head and epistoma evenly and densely punctured, except a small triangular space in the middle at the base; the thorax, marginal stria complete, punctured less regularly than the head, some of the punctures near the scutellum and along the base are the largest, there is a shallow fovea on either side well within the lateral border and midway between the basal and anterior edges, and there is a narrow smooth space before the scutellum; the elytra are transversely impressed at their bases and their punctuation is more even and rather more dense, especially at their apices, than that of the thorax, there is a humeral smooth boss; the propygidium and pygidium are very evenly and densely punctured, and the ridge dividing the latter segment is rounded off and not very prominent; the prosternum is arched at the base and closely punctured; the mesosternum has a marginal stria only at the sides, surface evenly punctate, and the punctures are much larger than those of the prosternum; the metasternum, the punctuation varies in size and is scattered, especially in the median area; the first segment of the abdomen is densely punctured, very similarly to that of the prosternum; the anterior tibiæ are 6-dentate and the legs red.

Hab. Jatahy, Province of Goyaz, Brazil (*E. Grounelle*).

Teretrius pilimanus, Mars.

Dr. H. Brauns has sent me from Willowmore, Cape Colony, the female of this species; it is much less robust than the male and the long hair is wanting on the anterior tibiæ. I have Marseul's type specimen from the Chevrolat collection which I purchased in 1877; it is a male.

Teretrius Marshalli, sp. n.

Cylindricus, brevis, niger, nitidus, antennis pedibusque rufis, supra parce punctatus; pronoto stria integra antice tenuiter impressa; prosterno antice truncato, bistriato, striis antice paululum divergentibus.

L. 1¾–2 mill.

Cylindrical, rather short, black and shining; the head convex above, vertex and epistoma finely or rather sparingly punctured, but along the base and the lateral border the punctures are much larger, striate over the eyes; the thorax and the elytra are more evenly punctured, and the punctures are much larger than those of *T. punctulatus*, Bohm, the sutural edge is narrowly smooth; the propygidium and pygidium are evenly punctured; the prosternum is marginate and anteriorly truncate, surface with shallow punctures, striæ reach the suture from the base and slightly and gradually diverge in front of the coxæ; the mesosternum is marginate anteriorly and the acumination is impressed behind the marginal stria; the anterior femora are distinctly punctate and the anterior tibiæ are 5–6-dentate.

T. punctulatus, Bohm, is much larger than *T. Marshalli*, but it is similar to it in the form of the prosternal striæ, in the punctuation of the anterior femora, and in the scape of the antennæ being free of pilosity in the male. Marseul's measurement of 3 mill. for *T. punctulatus* is less than the length of ordinary specimens of that species.

Hab. Salisbury, Mashonaland (*Guy A. K. Marshall*).

Teretrius quadristriatus, sp. n.

Cylindricus, niger, nitidus; antennis pedibusque rufo-brunneis; pronoto ante scutellum grosse punctato; prosterno utrinque bistriato; tibiis anticis 5-dentatis.
L. 1½ mill.

Cylindrical, black and shining, antennæ and legs reddish brown; the head convex above, punctate, punctures somewhat coarse and least closely set along the neck; the thorax is similarly punctured anteriorly, but nearer the base, especially before the scutellum, the punctures are much larger and oval, the marginal stria is complete but very fine behind the head; the elytra are more finely punctured and the points are less close in the median areas; the pygidia are evenly not densely punctured; the prosternum is finely marginate and the surface somewhat obscurely and rugosely punctate, the keel has two striæ on either side, the striæ are joined at the base and slightly and gradually diverge anteriorly, but the two inner striæ are almost parallel to one another; the mesosternum is rather obtuse in the middle and marginate, surface, and that of the metasternum also, is punctured but not closely; the anterior tibiæ are 5-dentate.

Teretrius mozambicus, Mars., is slightly larger than this species and similar in outline. The prosternal striæ are different to those of any other described species.

Hab. Salisbury, Mashonaland (*Guy A. K. Marshall*).

Teretrius indus, sp. n.

Cylindricus, subelongatus, brunneo-piceus, antennis pedibusque rufo-brunneis, undique punctulatus; prosterno lato, striis anticis paululum divergentibus; mesosterno in medio obtuse prominulo, marginato; propygidio parum convexo; tibiis anticis 5–6-dentatis.
L. 2¼ mill.

Cylindrical, rather elongate, pitchy brown and shining, wholly but not densely punctulate; the head is a little convex between the eyes; the thorax narrowest anteriorly, marginal stria complete, but extremely fine behind the head; the elytra also are not quite parallel laterally, and the smooth space below the shoulder, usually a little raised in this genus, is flat; the prosternum has a broad keel and the striæ are wide apart and diverge slightly in front, the anterior lobe is distinctly marginate both laterally and along its anterior edge; the mesosternum is marginate anteriorly and obtusely acuminate; the surfaces of the sterna and the first segment of the abdomen are somewhat sparingly punctulate; the anterior tibiæ are 5–6-dentate.

This species is larger and less parallel than *T. pulex*, Fairm., and the pygidium is more distinctly convex, but the sterna are constructed very similarly in both species.

Hab. Central Province, India, "from the galleries of bark-boring species, Oct. 1901" (*E. P. Stebbing*, No. 7).

Teretrius distinctus, sp. n.

Cylindricus, piceus, nitidus; prosterno conspicue marginato, striis obscuris, brevibus; mesosterno tenuiter marginato; abdomine segmento 5° in medio prominulo.

L. 1¼ mill.

Cylindrical, piceous, shining; the head convex, lateral stria rather strong, surface with that of thorax rather coarsely but not closely punctured; the elytra are rather less strongly punctate; the thorax is reddish at the anterior angles and the marginal stria complete and well-marked; the pygidia are equally but not densely punctured; the prosternum is markedly marginate, truncate anteriorly, oblique laterally, surface evenly and clearly punctate, striæ short and obscure; the mesosternum rather sharply acuminate, with a fine marginal stria, surface and also that of the metasternum punctate like that of the prosternum; the abdomen, the segment next to the pygidium has an overlapping semicircular projection in the middle of its posterior edge; the antennæ have long flavous hairs on the scape; the legs, anterior tibiæ 5-dentate.

I only know the male of this species, so that the projection in the abdominal segment may be a masculine character.

Hab. Algoa Bay (*Dr. H. Brauns*).

XL.—*On the Systematic Position of* Luvarus imperialis, *Rafinesque*[*]. By C. Tate Regan, B.A.

This rare fish, an inhabitant of the Mediterranean and the neighbouring parts of the Atlantic and an occasional visitor to our coasts, was placed by Günther in the Coryphænidæ,

---

[*] For the synonymy, see Day, Fishes Gt. Britain, i. p. 121, and Goode and Bean, 'Oceanic Ichthyology,' p. 222.

The following short diagnosis may be useful:—Depth of body about 3 to 3½ times in total length, length of head 3 (young) to 5 times. Eyes placed in the middle of the height of head, their diameter 4½ (young) to 7 times in the length of head. Snout ⅔ to ¾ as long as the postorbital part of head. Posterior nostril minute. Maxillary about as long as eye. D. 21-23, commencing above the eye, the rays increasing in height to and although Gill has separated it from them as the type of a distinct family, he has still retained the Luvaridæ among the Scombroid fishes, near the Coryphænidæ.

I have arrived at the conclusion that the Luvaridæ are closely allied to the Acanthuridæ. A comparison shows that in both families the body is oblong and compressed, the dorsal and anal fins long, the caudal peduncle slender, the caudal fin deep, the scales small, rounded, and usually rough, covering the head and body, and the lateral line concurrent with the dorsal profile. In both also the gill-membranes are broadly united to the isthmus, there are four gills, with a slit behind the fourth, five branchiostegals, well-developed pseudobranchiæ, and short gill-rakers.

In *Luvarus*, as in the Acanthuridæ, the mouth is small, the premaxillaries are not protractile, and the maxillaries are attached to them and not independently movable. The toothless palate, the palatine arch attached only to the pre-ethmoid, the coalescent pelvic bones, the separate lower pharyngeals, and the upper pharyngeals much compressed antero-posteriorly, are further points of agreement between the two families.

Luvarus, like the Acanthuridæ, is a vegetable feeder, and exactly resembles them in its visceral anatomy *. The stomach is large and thick-walled, the pyloric appendages short, simple, and few in number, and the intestine very long and much coiled; the air-bladder is large.

The skeleton † of *Luvarus* resembles that of the Acanthuridæ in many features. The most striking correspondence is seen in the vertebral column, the vertebræ numbering twenty-two in both cases, the first being very short and more

---

about the fourteenth, which is as long as the head in the young, shorter in the adult, the last 10 rays branched, the anterior rays wider apart than the rest. A. 17–18, similar to the dorsal. In large specimens, D. 12–14, A. 13–15, the anterior rays having disappeared, their interneurals and interhæmals forming bony ridges in the dorsal and ventral middle lines respectively; some specimens (? males) with the first ray of the reduced fins more or less elongate. Pectorals elongate, nearly ¼ the length of body. Ventrals I 4, slightly in front of the pectorals, the soft rays elongate in the young and absent in the adult. Caudal peduncle slender, keeled in the adult, caudal deeply lunate. Scales very small, rough, shagreen-like. Bluish above, silvery below and on the sides. Fins red. The young with 5 or 6 longitudinal series of round black spots on the sides and dark dorsal and anal fins.

* For the visceral anatomy see Cuv. & Val. ix. p. 358, and compare with Acanthuridæ described in vol. x. Also Nardo, 'De Proctostego,' 1827, and Haller, in Krukenberg, Vergl. Physiol. Stud. iv. 1881, p. 1.

† Gunther (Proc. Zool. Soc. 1866, p. 330) gives a short description of the skeleton, with a plate (not well executed).

or less regularly convex anteriorly, fitting the concavity formed by the facets of the basi- and exoccipitals, the second without ribs, as usual in Perciform fishes, the next seven bearing ribs, and succeeded by thirteen caudals. The ribs are very similar in each case, but in *Luvarus* they are more blade-like. A notable difference is that in the Acanthuridæ the præcaudals have well-developed parapophyses, to which epipleurals are attached, and subsessile ribs; *Luvarus*, on the contrary, has only rudimentary parapophyses, apparently no epipleurals, and sessile ribs.

According to Siebenrock * in *Luvarus* the post-temporal is attached above to the skull, and lower down emits a short rounded process which joins the squamosal, whilst its distal end is long and attached to the clavicle, there being no supra-clavicle, unless this bone represents the co-ossified post-temporal and supra-clavicle. As this bone is attached distally to the clavicle and proximally to the same parts of the skull as the post-temporal in Acanthuridæ, the probability that it represents both supra-clavicle and post-temporal is very great; in having this latter bone forked *Luvarus* is less specialized than the Acanthuridæ, in which family the post-temporal is simple, owing to the reduction of the process which joins it to the squamosal. It is worth noting that in many characters *Luvarus* approaches more closely to *Naseus* than to any other genus, notably in the long anal fin extending to the vent, which is situated just behind the origin of the ventrals, and in the physiognomy of the head. *Naseus* is the only genus of Acanthuridæ with pointed teeth in the jaws, and in some species these are quite feeble, so that in this character also it approaches *Luvarus*, the young of which have a single series of small pointed teeth in the jaws. The similarity of the keel-like plates on the caudal peduncle in both genera is evident, and the posterior nostril is noticeably small in *Naseus* and minute in *Luvarus*.

Apparently the remarkable feature of the loss of the anterior rays of the dorsal and anal fins during growth is peculiar to *Luvarus*, and not paralleled in the Acanthuridæ.

The Luvaridæ may be defined thus:—

Similar to the Acanthuridæ, but with feebly ossified skeleton, very weak dentition, and post-temporal forked. Præcaudal vertebræ with rudimentary transverse processes; ribs sessile, blade-like, inserted at the middle of the length of the centrum; epipleurals absent. Anterior rays of dorsal and anal unbranched, but not forming pungent spines. Ventrals with one spine and four soft rays.

---

* Ann. Hofmus. Wien, xvi. 1901, pp. 119 & 125.

The Luvaridæ may be considered as ultra-specialized Acanthuridæ, and it is generally agreed that the Plectognathi are descendants of the same family, the origin of which is by no means so settled a question. Jordan and Evermann place them near the Chætodonts, with the Zanclidæ as a connecting family; but this arrangement has recently been criticized by Swinnerton*, in his valuable paper on the morphology of the Teleostean head-skeleton. He considers the mode of attachment of the palatine arch to be a character of great importance, and shows that most Acanthopterygii have the palatine attached to the ethmoid region at two points—the pre-ethmoid and par-ethmoid cornua—whilst the Plectognathi, with the allied Zanclidæ and Acanthuridæ, have only the pre-ethmoid attachment. This leads him to the conclusion that the origin of the Acanthuridæ is not to be sought within the Acanthopterygii, but lower down, and that they may be more nearly allied to the Scombresoces, which have a single palatine attachment. This position would require strong arguments to substantiate it, as the Acanthuridæ are typically Acanthopterygii in all other characters, and, judging by what we know of the fossils, are not a family of great antiquity.

I have not the least doubt that the Teuthididæ are closely allied to the Acanthuridæ, and on examination I find that in *Teuthis* the palatine is attached to pre-ethmoid and par-ethmoid by two facets. Moreover, the author above mentioned, in the same paper, describes the attachment of the palatine in *Chætodon* in these words:—"The palatine lies against the par-ethmoid, it is united to that bone exclusively by ligaments, and the articular surfaces have aborted." Here, then, we have an intermediate condition between the mode of attachment in the typical Acanthopterygii and that of the Acanthuridæ, and it only needs the elongation of the ethmoid region, thus removing the par-ethmoid from contact with the palatine, to produce the arrangement which characterizes that family. It seems therefore that the position of the Acanthuridæ near the Chætodonts is by no means weakened by the consideration of the ethmo-palatine attachment, and, as the two families approach each other in many characters of importance, that they have been rightly placed near together in the system.

---

* Quart. Journ. Micr. Sci. xiv. 1901, pp. 555, 582, & 583.

XLI.—*Rhynchotal Notes.*—XV. Heteroptera: *Family* Reduviidæ (*continued*), Piratinæ *and* Ectrichodinæ. By W. L. Distant.

All the species described by Walker in the Piratinæ and Ectrichodinæ have been examined and their position considered in this paper, while some of those he described under the genus *Reduvius*, and which were left over from the last paper, are now determined; but a few more await further investigation, and will be dealt with subsequently. A number of new species contained in the National Collection are described at the same time.

Piratinæ.

Genus Ectomocoris.

Ectomocoris atrox.

Pirates atrox, Stål, Œfv. Vet.-Ak. Forh. 1855, p. 187.
Pirates diffinis, Walk. Cat. Het. vii. p. 120 n. 77 (1873).
Pirates ypsilon, Kirby, Journ. Linn. Soc., Zool. xxiv p 113, pl. iv. fig 8 (1891).
Pirates stigmativentris, Kirby, *loc. cit.* p. 112. (Immature form.)

Ectomocoris quadriguttatus.

Reduvius quadriguttatus, Fabr. Spec. ii. p. 380 (1781).
Pirates sexmaculatus, Walk. Cat. Het. vii. p. 116. n. 70 (1873).
Pirates decisus, Walk. *loc cit.* p. 118. n. 73.

Walker, in his description of *P. decisus* (*supra*), has omitted to mention that the posterior lobe of the pronotum is testaceous.

Ectomocoris rufifemur.

Pirates rufifemur, Walk. Cat. Het vii. p. 119. n. 76 (1873).
Eumerus insignis, Reut. Act. Soc. Sc. Fennic. xii. p. 317 (1881).
Eumerus Reuteri, Bol. Ann. Soc. Ent. Fr. 1882, p. 404.

The spot described by Walker as near the tip of the corium is really in the membrane. Reuter's description of *E. insignis* will correctly replace the pseudo-description given by Walker of his *E. rufifemur*.

Ectomocoris posticus.

Pirates posticus, Walk. Cat. Het. vii. p. 115. n. 69 (1873).
Eumerus flaviger, Stål, En. Hem. iv. p. 61 (1874).

Ectomocoris elegans.

Reduvius elegans, Fabr. Syst. Rhyng. p. 270 (1803).
Pirates inscriptus, Walk. Cat. Het. vii. p. 115. n. 68 (1873).

Ectomocoris cordiger.

Ectomocoris cordiger, Stål, Œfv. Vet.-Ak. Forh. 1866, p. 256.
Pirates adjunctus, Walk. Cat. Het. vii. p. 114. n. 67 (1873).

Ectomocoris biguttulus.

Ectomocoris biguttulus, Stål, Œfv. Vet.-Ak. Forh. 1870, p. 692.
Pirates caliginosus, Walk. Cat. Het. vii. p. 123. n. 92 (1873).

Ectomocoris decoratus.

Pirates decoratus, Stål, Ann. Soc. Ent. Fr. 1863, p. 57.
Pirates decorellus, Walk. Cat. Het. vii. p. 129. n. 110 (1873).
Sirthenea decorella, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 129 (1896).

Ectomocoris truculentus.

Pirates truculentus, Stål, Ann. Soc. Ent. Fr. 1863, p. 56. (Immature form, type in Brit. Mus.)
Eumerus fasciola, Reut. Act. Soc. Sc. Fennic. xii. p. 315 (1881).

Ectomocoris pictus, sp. n.

Head, pronotum, and scutellum black, shining, posterior lobe of pronotum more or less piceous brown; corium and membrane piceous, opaque; apex of clavus connected with a lunate spot on corium, a spot near base of membrane, and basal margin of membrane at apex of corium, stramineous; connexivum, coxæ, legs, and rostrum ochraceous; sternum piceous, abdomen castaneous; lateral margins of meso- and metasterna and lateral margins of abdomen stramineous; connexivum above and beneath spotted with castaneous; basal joint of antennæ castaneous, remaining joints fuscous; antennæ thickly and finely pilose; legs longly pilose; anterior lobe of pronotum distinctly finely centrally sulcate, obscurely longitudinally sulcate on lateral areas; body beneath finely but sparingly tomentose.

Long. 14–15 millim.

Hab. Brit. East Africa: Athi River (*C. S. Betton*, Brit. Mus.).

Genus PIRATES.

Pirates atromaculatus.

Cleptocoris atromaculatus, Stål, Œfv. Vet.-Ak. Forh. 1870, p. 692.
Pirates sinensis, Walk. Cat. Het. vii. p. 114. n. 66 (1873).

Pirates sanctus.

Reduvius sanctus, Fabr. Mant. ii. p. 310 (1787).
Lestomerus sanctus, Walk. Cat. Het. vii. p. 94 (1873).
Pirates latifer, Walk. *loc. cit.* p. 119. n. 75.

Pirates affinis.

Peirates affinis, Serv. Ann. Sci. Nat. xxiii. p. 216 (1831).
Lestomerus affinis, Walk., var. ?, Cat. Het. vii. p. 91 (1873).
Lestomerus piceipennis, Walk. *loc. cit.* p. 92. n. 5.
Var. *Lestomerus diffinis*, Walk. *loc. cit.* n. 7.
Pirates Walkeri, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 127 (1896).

Pirates arcuatus.

Spilodermus arcuatus, Stål, Œfv. Vet.-Ak. Forh. 1870, p. 602.
Pirates mutilloides, Walk. Cat. Het. vii. p. 120 n 79 (1873).

Pirates femoralis.

Lestomerus femoralis, Walk. Cat. Het. vii. p. 92. n. 6 (1873).
Pirates (*Lestomerus*) *cruciatus*, Horv. Term. Fuz. iii. p. 148 (1879).
Pirates bicoloripes, Bredd. Abh. Ges. Halle, xxiv. p. 101 (1901).

Although Walker only described the four anterior femora as being "towards the base" "tawny," the whole of the femora are reddish, varying in extent of that coloration from the base.

Pirates turpis.

Pirates turpis, Walk. Cat. Het. vii. p. 120. n. 78 (1873).
Pirates (*Cleptocoris*) *brachypterus*, Horv. Termesz. Fuzetek, iii. p. 148 (1879).
Pirates concolor, Jakowleff, Bull. Mosc. lvi. p. 213 (1881).
Pirates (*Cleptocoris*) *mœstus*, Reut. Act. Soc. Sc. Fennic. xii. p. 311 (1881).

Pirates glaber.

Pirates glaber, Walk. Cat. Het. vii. p. 129. n. 111 (1873).
Sirthenea glabra, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 129 (1896).

Allied to *P. ephippiger*, White.

Pirates sobrius.

Pirates sobrius, Walk. Cat. Het. vii. p. 128. n. 107 (1873). (Immature form.)
Sirthenea sobria, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 129 (1896).

Pirates noctis, sp. n.

Piceous black, opaque, membrane shining; first and second joints of the antennæ (remainder mutilated), apices of anterior femora, outer surfaces of intermediate and posterior femora, the tibiæ and tarsi testaceous; disk of abdomen beneath more or less obscure testaceous. Anterior lobe of pronotum centrally sulcate and obscurely furrowed on each lateral area:

legs and antennæ longly pilose; eyes and ocelli obscure stramineous.

Long. 25 millim.

Hab. Madagascar: Antananarivo (*Rev. R. Toy*, Brit. Mus.).

Pirates aurigans, sp. n.

Head, pronotum, scutellum, sternum, rostrum, antennæ, and legs black; corium, membrane, and abdomen beneath dark piceous brown; connexivum above and beneath and a discal longitudinal fascia to corium (commencing on claval margin at about one third from base, terminating on basal margin of membrane, a little widened interiorly near centre, where it emits a short transverse spur) golden yellow; a discal spot to corium and a larger discal spot to membrane black. Anterior lobe of pronotum with a distinct central basal fovea, the lateral areas obscurely sulcate; scutellum with the lateral margins and apex strongly carinate; antennæ thickly and finely pilose, second and third joints subequal in length.

Long. 12–13 millim.

Hab. Brit. East Africa: El donyo eb Viru (*C. S. Betton*, Brit. Mus.).

Pirates marginiventris, sp. n.

Dull dark castaneous; head, corium, and membrane piceous; connexivum above and beneath, antennæ, rostrum, legs, and basal lateral angles of corium ochraceous; antennæ with the second and third joints infuscated. Anterior lobe of pronotum finely centrally sulcate, lateral areas obscurely sulcate; membrane distinctly passing the apex of abdomen, its apical margin pale fuliginous.

Long. 10–11 millim.

Hab. Brit. East Africa: Athi River, Athi-ya-Mawe (*C. S. Betton*, Brit. Mus.).

Pirates sepulchralis, sp. n.

Black, shining, corium and membrane opaque; apical half of clavus connected with a somewhat similar spot on corium at claval margin, the apical fringe to tibiæ, and apex of second joint to rostrum ochraceous; tarsi brownish ochraceous. Head between the eyes centrally sulcate; anterior lobe of pronotum narrowly centrally sulcate on posterior half; apex of scutellum upwardly tuberculate; anterior femora strongly incrassated and spined beneath, four spines on apical half.

Long. 23 millim.

Hab. West Australia (*E. H. Saunders*, Brit. Mus.).

Genus RASAHUS.

Rasahus maculipennis.

Reduvius maculipennis, Lepell. & Serv. Encyl. Méth. x. p. 276 (1825).
Pirates biplagiatus, Walk. Cat. Het. vii. p. 105. n. 34 (1873).

Rasahus flavovittatus.

Sphodrocoris flavovittatus, Stål, En. Hem. ii. p. 107 (1872).
Pirates vittifer, Walk. Cat. Het. vii. p. 106. n. 35 (1873).

Mr. Champion has compared the types of Stål and Walker.

Rasahus rufiventris.

Pirates rufiventris, Walk. Cat. Het. vii. p. 107. n. 38 (1873).

Rasahus æneus.

Pirates æneus, Walk. Cat. Het. vii p. 108. n. 40 (1873).

Genus SIRTHENEA.

Sirthenea flavipes.

Rasahus flavipes, Stål, Œfv. Vet.-Ak. Forh. 1855, p. 187.
Rasahus Cumingi, Dohrn, Stett. ent. Zeit. xxi. p. 407 (1860).
Pirates strigifer, Walk. Cat. Het. vii. p. 116. n. 71 (1873).
Pirates basiger, Walk. *loc. cit.* p. 117. n. 72.

Sirthenea horrida.

Lestomerus horridus, Kirby, Journ. Linn. Soc., Zool. xxiv. p. 111, pl. iv. fig. 16 (1891).

Kirby's type is an immature specimen. I have since received perfect examples from Ceylon and Burma, and the British Museum also contains another Burmese immature but more fully developed specimen than the Ceylonese type.

♂. Hemelytra reaching apex of abdomen, piceous, opaque; apical area of clavus and a fused spot on claval margin of corium and a spot on basal area of membrane pale ochraceous.

Sirthenea vittata, sp. n.

Head, pronotum, and scutellum shining black; corium, membrane, body beneath, rostrum, and legs piceous brown; an elongate longitudinal discal vitta to corium, antennæ, apices of intermediate and posterior coxæ, upper surface and a vitta on each side of anterior femora, bases of intermediate and posterior femora, bases of tibiæ, and a central and marginal series of spots to abdomen pale ochraceous. Elongate; finely pilose; anterior lobe of pronotum longitudinally sculptured and centrally sulcate; scutellum centrally foveate, its margins and apex strongly carinate.

Long. 15 millim.

Hab. Colombia: Cali (*Rosenberg*, Brit. Mus.). Trinidad (Coll. Dist.).

Summarized Disposition of Walker's Genera and Species belonging to the Subfam. **Piratinæ.**

Species considered valid and described under correct Genera.

Pirates planus, Walk. Cat. Het. vii. p. 111. n. 52 (1873).
—— *dimidiatus*, Walk. *loc. cit.* n. 54 (nec *dimidiatus*, p. 102. n. 23).
—— *instabilis*, Walk. *loc. cit.* p. 118. n. 74.
—— *turpis*, Walk. *loc. cit.* p. 120. n. 78.
—— *concinnus*, Walk. *loc. cit.* p. 124. n. 93.
—— *sobrius*, Walk. *loc. cit.* p. 128. n. 107. An immature form, sp.?
—— *fulvipennis*, Walk. *loc. cit.* n. 108.
—— *erythromelas*, Walk. *loc. cit.* n. 109.
—— *glaber*, Walk. *loc. cit.* p. 129. n. 111.

Species considered valid, but requiring generic revision.

Lestomerus femoralis, Walk. Cat. Het. vii. p. 92. n. 6 (1873), belongs to gen. *Pirates*.
—— *flavipes*, Walk. *loc. cit.* p. 93. n. 8, belongs to gen. *Pirates*.
Pirates degener, Walk. *loc. cit.* p. 100. n. 20, belongs to gen. *Melanolestes*.
—— *rufiventris*, Walk. *loc. cit.* p. 107. n. 38, „ „ *Rasahus*.
—— *æneus*, Walk. *loc. cit.* p. 108. n. 39, „ „ „
—— *minusculus*, Walk. *loc. cit.* n. 40, „ „ *Leogorrus*.
—— *posticus*, Walk. *loc. cit.* p. 115. n. 69, „ „ *Ectomocoris*.
—— *rufifemur*, Walk. *loc. cit.* p. 119. n. 76, „ „ „
—— *interruptus*, Walk. *loc. cit.* p. 124. n. 94, „ „ *Velitra*.

Species treated as synonymic.

Lestomerus picripennis, Walk. Cat. Het. vii. p. 92. n. 5 (1873), = *Pirates affinis*, Serv.
—— *diffinis*, Walk. *loc. cit.* n. 7, = *Pirates affinis*, var.
Pirates semirufus, Walk. *loc. cit.* p. 99. n. 17, = *Thymbreus crocinopterus*, Stål.
—— *mexicanus*, Walk. *loc. cit.* n. 18, = *Rasahus guttatipennis*, Stål.
—— *concisus*, Walk. *loc. cit.* p. 101. n. 22, = *Rasahus hamatus*, Fabr.
—— *morio*, var., Walk. *loc. cit.* p. 104. n. 30, = *Rasahus arciger*, Stål.
—— *indecisus*, Walk. *loc. cit.* n. 32, = *Rasahus hamatus*, Fabr.
—— *lepidus*, Walk. *loc. cit.* p. 105. n. 33, = *Phorastes femoratus*, De Geer.
—— *biplagiatus*, Walk. *loc. cit.* p. 84, = *Rasahus maculipennis*, Lep. & Serv.
—— *vittifer*, Walk. *loc. cit.* p. 106. n. 35, = *Rasahus flavovittatus*, Stål.
—— *megaspilus*, Walk. *loc. cit.* n. 36, = *Leogorrus picturatus*, Stål.
—— *hamifer*, Walk. *loc. cit.* p. 107. n. 37, = *Rasahus albomaculatus*, Mayr.
—— *sinensis*, Walk. *loc. cit.* p. 114. n. 66, = *Pirates atromaculatus*, Stål.
—— *adjunctus*, Walk. *loc. cit.* n. 67, = *Ectomocoris cordiger*, Stål.
—— *inscriptus*, Walk. *loc. cit.* p. 115. n. 68, = *Ectomocoris elegans*, Fabr.

Pirates sexmaculatus, Walk. *loc. cit.* p. 116. n. 70, = *Ectomocoris quadriguttatus*, Fabr.
—— *strigifer*, Walk. *loc. cit.* n. 71, = *Sirthenea flavipes*, Stål.
—— *banger*, Walk. *loc. cit*, p. 117. n. 72, = *Sirthenea flavipes*, Stål.
—— *decius*, Walk. *loc. cit.* p. 118. n. 73, = *Ectomocoris quadriguttatus*, Fabr.
—— *latifer*, Walk. *loc. cit.* p. 119. n. 75, = *Pirates sanctus*, Fabr.
—— *diffinis*, Walk. *loc. cit.* p. 120. n. 77, = *Ectomocoris atrox*, Stål.
—— *mutilloides*, Walk. *loc. cit.* n. 79, = *Pirates arcuatus*, Stål.
—— *caliginosus*, Walk. *loc. cit.* p. 123, n. 92, = *Ectomocoris biguttulus*, Stål.
—— *sculpturatus*, Walk. *loc. cit.* p, 125. n. 95, = *Acanthaspis flavovaria*, Hahn.
—— *decorellus*, Walk. *loc. cit.* p. 129. n. 110, = *Ectomocoris decoratus*, Stål.
—— *contiguus*, Walk. *loc. cit.* p. 130. n. 112, = *Rasahus hamatus*, Fabr,

To be treated as non-existent.

Species the types of which are not now to be found in the British Museum.

Lestomerus diversus, Walk. Cat. Het. vii. p. 93. n. 9 (1873).
—— *formicarius*, Walk. *loc. cit.* p. 94. n. 10.
Pirates dimidiatus, Walk. *loc. cit.* p. 102. n. 23 (nec *dimidiatus*, p. 111. n. 54).
—— *sinicus*, Walk. *loc. cit.* p. 121. n. 83.
—— *trinotatus*, Walk. *loc. cit.* p. 130. n. 113,

ECTRICHODINÆ.

Genus SANTOSIA.

Santosia erythrocephala.

Reduvius erythrocephalus, Wolff, Icon. iii. p. 126, fig. 120 (1802).
Var. *Ectrichodia diminuens*, Walk. Cat. Het. viii. p. 45. n. 28 (1873).

Santosia lugubris, sp. n.

Black, opaque; head, antennæ, rostrum, pronotum, scutellum, and legs brownish ochraceous; basal half of posterior femora, sometimes basal halves of all the femora, black; antennæ very longly pilose, first joint a little longer than pronotum, second joint a little longer than first; anterior lobe of pronotum a little shorter than posterior lobe, centrally finely but deeply sulcate, sulcation not reaching base of posterior lobe; femora obscurely subnodulose at apices.

Long. 13–15 millim.

Hab. Borneo: Sarawak (*Shelford*, Brit. Mus.).

The type in the British Museum has only the basal half of the posterior femora black; another specimen in my own collection, also received from Mr. Shelford, has the halves of all the femora black.

Genus HÆMATOLŒCHA.

Hæmatolœcha nigrorufa.

Scadra nigrorufa, Stål, Œfv. Vet.-Ak. Förh 1866, p. 301.
Ectrichodia includens, Walk. Cat. Het. viii. p. 51. n. 50 (1873)

Hæmatolœcha Ridleyana, sp. n.

Head and pronotum reddish ochraceous; fascia between eyes and base of head, fascia at transverse constriction, central sulcation and basal margin of pronotum, black; scutellum and hemelytra black, basal angle of hemelytra reddish ochraceous; connexivum reddish ochraceous, with large subquadrate black spots; central area to head beneath and sternum black; abdomen piceous, its lateral margins spotted with reddish ochraceous and somewhat luteous on disks of fifth and sixth segments; legs stramineous, apices of femora, bases and apices of tibiæ, and apices of tarsi piceous; antennæ with the first and second joints fuscous, third and fourth joints stramineous, base of third and apex of fourth fuscous, remaining joints mutilated.

♀. Anterior femora only moderately incrassated; central impression somewhat obsolete to anterior lobe of pronotum, profound to posterior lobe, sublateral impressions profound, subcrenulate.

Long., ♀, 20 millim.

Hab. Singapore (*H. N. Ridley*, Brit. Mus.).

Genus MINDARUS.

Mindarus discus.

Ectrychotes discus, Burm. Handb. ii. p. 238 (1835).
Ectrichodia venusta, Walk. Cat. Het. viii. p. 58. n. 72 (1873).

Mindarus nitidissimus.

Ectrichodia nitidissima, Walk. Cat. Het. viii. p. 57. n. 71 (1873).

Mindarus decolor.

Reduvius decolor, Walk. Cat. Het. vii p. 185. n. 14 (1873).
Ectrichodia nigroscutata, Walk. *loc. cit.* viii. p. 60. n. 80.

Mindarus pallitarsis.

Ectrichodia pallitarsis, Walk. Cat. Het. viii. p. 59. n. 79 (1873).

Mindarus colossus, sp. n.

Black; central fascia to head broadened between the eyes, a somewhat large spot on each lateral area of the anterior pronotal lobe, two small discal spots near transverse constriction and basal margin of posterior pronotal lobe, a spot near base, two discal lines (the innermost smallest) to corium, spots to connexivum, three discal series of spots, a lateral marginal series of spots, and apical segmental margin to abdomen beneath, apices of all the femora above, base of posterior femora above, and tibiæ (excluding bases and apices) sanguineous; antennæ with the first four joints black, pilose, remainder mutilated; lateral areas of the head striate; body somewhat broad and robust.

Long. 29 millim.; exp. pronot. angl. 8½ millim.

Hab. Paraguay (Brit. Mus.).

Genus Zirta.

Zirta hirticornis.

Reduvius hirticornis, Fabr. Ent. Syst., Suppl. p. 544 (1798).
Ectrichodia atripennis, Walk. Cat. Het. viii. p. 56. n. 69 (1873).

Zirta simillima, sp. n.

Closely allied to *Z. hirticornis*, but differing by having the posterior lobe of the pronotum smooth, not rugulose, and the scutellum and connexivum totally black.

Black; head and anterior lobe of pronotum dull ochraceous, posterior pronotal lobe reddish ochraceous.

Long. 18 millim.

Hab. Brazil (Brit. Mus.). Amazons: St. Paulo (Coll. Dist.).

Zirta granulata.

Ectrichodia granulata, Walk. Cat. Het. viii. p. 58. n. 73 (1873).

Genus Cleptria.

Cleptria mombasæ, sp. n.

♂. Head, pronotum, scutellum, and legs brownish ochraceous; mucronate apices of the scutellum sanguineous; hemelytra black, opaque; base of corium and clavus and lateral margin of corium continued inwardly near apex brownish ochraceous; coxæ, bases of femora, anterior and intermediate tibiæ and tarsi, rostrum, and body beneath ochraceous; lateral areas of meso- and metasterna, abdominal incisures, and anal segment piceous; antennæ brownish piceous, strongly pilose; eyes and area of ocelli black. Second joint of antennæ slightly longer than the first: vertex of head distinctly sulcate between eyes; pronotum finely centrally sulcate, the sulcation neither reaching the anterior nor posterior margin, posterior lobe profoundly sulcate near lateral angles.

Long., ♂, 17 millim.

Hab. East Africa: Mombasa (Brit. Mus.).

Genus MENDIS.

Mendis pectoralis.

Mendis pectoralis, Stål, Ann Soc Ent. Fr. 1863, p. 46.
Mendis japonensis, Scott, Ann. & Mag. Nat Hist. (4) xiv. p. 445 (1874).

Mendis semirufa.

Ectrichodia semirufa, Stål, Œfv. Vet.-Ak. Forh. 1854, p. 237.
Ectrichodia luteoatra, Walk. Cat Het. viii. p 53. n. 57 (1873).
Adrania luteoatra, Leth. & Sev. Cat. Gén Hém. t iii. p 135 (1896).

Mendis chinensis, sp. n.

Sanguineous, shining; antennæ (excluding basal joint), eyes, hemelytra, spots to connexivum on fourth and fifth segments, four spots to metasternum (two central and one on each side), a small lateral spot to second abdominal segment, and large transverse lateral spots to third, fourth, and fifth segments black; tarsi brownish ochraceous; basal joint of antennæ dull testaceous; antennæ very longly pilose, second joint slightly longer than the first; anterior pronotal lobe foveately sulcate throughout its entire length, posterior lobe much more finely sulcate for about half its length.

Long. 11 millim.

Hab. China: Amoy (Brit. Mus.).

Genus ECTRYCHOTES.

Ectrychotes porrigens.

Ectrichodia porrigens, Walk. Cat. Het. viii. p. 47. n. 34 (1873).
Physorhynchus porrigens, Leth. & Sev. Cat. Gen. Hém. t. iii. p. 140 (1896).

Ectrychotes atripennis.

Larymna atripennis, Stål, Œfv. Vet.-Ak. Forh. 1866, p. 302.
Ectrichodia ophirica, Walk. Cat. Het. viii. p. 51. n. 49 (1873).
Scadra ophirica, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 133 (1896).

Genus PHYSORHYNCHUS.

Physorhynchus Linnæi.

Ectrichodia Linnéi, Stål, Œfv. Vet.-Ak. Forh. 1859, p. 178.
Ectrichodia discrepans, Walk. (part.), Cat. Het. viii. p. 46. n. 33 (1873).

Physorhynchus marginatus.

Physorhynchus (*Hæmatorrhopus*) *marginatus*, Reut. Act. Soc. Sc. Fennic. xii. p. 301 (1881).
Ectrichodia discrepans, Walk. (part.), Cat. Het. viii. p. 46. n. 33 (1873).

Genus CENTRASPIS.

Centraspis ducalis, sp. n.

Head, hemelytra, rostrum, body beneath, and legs shining black; pronotum, scutellum, connexivum, lateral margins of sternum and abdomen (widest on sternum and at apex of abdomen), anal abdominal segment, and the coxæ ochraceous; two discal spots to posterior lobe of pronotum, three elongate basal spots to scutellum, and suffusions to coxæ black; antennæ with the first joint black, second brownish piceous, remaining joints mutilated. Pronotum profoundly transversely and longitudinally sulcate, the sulcations fine and impunctate.

Long. 27 millim.; exp. pronot. angl. 7½ millim.

Hab. Ashantee (*W. H. Adams*, Brit. Mus.).

Genus VILIUS.

Vilius melanopterus.

Vilius melanopterus, Stål, Ann. Soc. Ent. Fr. 1863, p. 45.
Ectrichodia insignis, Walk. Cat. Het. viii. p. 48. n. 39 (1873).
Ectrichodia limbifera, Walk. *loc. cit.* p. 49. n. 43.
Mendis insignis, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 137 (1896).

Vilius macrops.

Ectrichodia macrops, Walk. Cat. Het. viii. p. 48. n. 42 (1873).

Doubtfully distinct from the preceding species.

Vilius intermedius.

Ectrichodia intermedia, Walk. Cat. Het. viii. p. 50. n. 48 (1873).
Scadra intermedia, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 132 (1896).

Vilius albomaculatus, sp. n.

Black, shining, hemelytra opaque; head, rostrum, lateral and anterior margins of anterior lobe of pronotum, spots to second, third, and fourth segments of connexivum, body beneath, and legs ochraceous; eyes, a broad central annulation to femora, tibiæ (excluding base), tarsi, lateral spots to fourth, fifth, and sixth abdominal segments, two small central spots to sixth segment, anal segment and abdominal apex, and a lateral spot to the pro- and mesosterna black; antennæ with the first and second joints piceous, remaining joints mutilated, base of first joint ochraceous; hemelytra with a discal greyish-white spot; basal joint of antennæ distinctly longer than head; central sulcation to pronotum broad and foveate.

Long. 18 millim.

Hab. Malay Peninsula: Selangore (*H. N. Ridley*, Brit. Mus.).

SCHOTTUS, gen. nov.

Antennæ four-jointed, moderately pilose, joints moderately robust, first and second stoutest, first joint about as long or almost as long as head, second almost half as long again as first, third and fourth more slender and subequal; rostrum with the first joint longer than the second, very little shorter in length than second and third joints together; head broad, gibbous behind the eyes, constricted at base; pronotum centrally foveately sulcate, from base of anterior to near base of posterior lobe, longitudinally sulcate near posterior angles, transverse constriction interrupted at central sulcation; scutellum biangulate posteriorly, the mucronate angles somewhat widely separated; connexivum exposed, upwardly directed; hemelytra almost reaching apex of abdomen; anterior femora not prominently incrassated, unarmed; abdomen centrally ridged beneath; sternum broadly channelled between the intermediate coxæ.

A genus allied to *Vilius*, but at once separated by the structure of the rostrum, robust second joint of antennæ, &c.

Schottus sulicus.

Ectrichodia sulica, Walk. Cat. Het. viii. p. 50. n. 47 (1873).
Scadra sulica, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 133 (1896).

Hab. Sula (Brit. Mus.).

Schottus luteicollis.

Ectrichodia luteicollis, Walk. Cat. Het. viii. p. 52. n. 61 (1873).
Scadra luteicollis, Leth. & Sev. Cat. Gén. Hém. t. iii. p. 132 (1896).

Hab. Borneo; Malay Peninsula (Brit. Mus.).

Summarized Disposition of Walker's Genera and Species belonging to the Subfam. **Ectrichodinæ.**

Species considered valid and described under correct Genera.

Ectrichodia tibialis, Walk. Cat. Het. viii. p. 62. n. 95 (1873).

Species considered valid, but requiring generic revision.

Ectrichodia diversipes, Walk. Cat. Het. viii. p. 41. n. 11 (1873), belongs to gen. *Physorhynchus*.
—— *marginicollis*, Walk. *loc. cit.* p. 42. n. 12, belongs to gen. *Physorhynchus*.
—— *porrigens*, Walk. *loc. cit.* p. 47. n. 34, " " *Ectrychotes*.
—— *macrops*, Walk. *loc. cit.* p. 48. n. 42, " " *Vilius*.
—— *aliena*, Walk. *loc. cit.* p. 49. n. 46, " " *Scadra*.
—— *sulica*, Walk. *loc. cit.* p. 50. n. 47, " " *Schottus*, g. n.
—— *intermedia*, Walk. *loc. cit.* n. 48, " " *Vilius*.
—— *luteicollis*, Walk. *loc. cit.* p. 52. n. 51, " " *Schottus*, g. n.
—— *cylindrica*, Walk. *loc. cit.* p. 53. n. 56, " " *Adrama*.
—— *nitidissima*, Walk. *loc. cit.* p. 57. n. 71, " " *Mindarus*.
—— *granulata*, Walk. *loc. cit.* p. 58. n. 73, " " *Zirta*.
—— *pallitarsis*, Walk. *loc. cit.* p. 59. n. 79, " " *Mindarus*.
Reduvius decolor, Walk. *loc. cit.* vii. p. 185. n. 14, belongs to gen. *Mindarus*.

Species treated as synonymic.

Ectrichodia diminuens, Walk. Cat. Het. viii. p. 45. n. 28 (1873), = *Santosia erythrocephala*, Wolff, var.
—— *discrepans*, Walk. (part.), *loc. cit.* p. 46. n. 33, = *Physorhynchus Linnæi*, Stål.
—— *discrepans*, Walk. (part.), *loc. cit.* p. 46. n. 33, = *Physorhynchus marginatus*, Reut.
—— *insignis*, Walk. *loc. cit.* p. 48. n. 39, = *Vilius melanopterus*, Stål.
—— *limbifera*, Walk. *loc. cit.* p. 49. n. 43, = *Vilius melanopterus*, Stål.
—— *ophirica*, Walk. *loc. cit.* p. 51. n. 49, = *Ectrychotes atripennis*, Stål.
—— *includens*, Walk. *loc. cit.* n. 50, = *Hæmatoloecha nigrorufa*, Stål.
—— *luteoatra*, Walk. *loc. cit.* p. 53. n. 57, = *Mendis semirufa*, Stål.
—— *atripennis*, Walk. *loc. cit.* p. 56. n. 69, = *Zirta hirticornis*, Fabr.
—— *fervida*, Walk. *loc. cit.* p. 57. n. 70, = *Ectrichodia crudelis*, Stål.
—— *venusta*, Walk. *loc. cit.* p. 58. n. 72, = *Mindarus discus*, Burm.
—— *nigroscutata*, Walk. *loc. cit.* p. 60. n. 80, = *Mindarus decolor*, Walk.
—— *media*, Walk. *loc. cit.* p. 62. n. 94, = *Ectrichodia cruciata*, Say.
Pothea centralis, Walk. *loc. cit.* p. 63. n. 8, = *Pothea lugens*, Fabr.
—— *reciproca*, Walk. *loc. cit.* p. 64. n. 9, = *Pothea ænescens*, Stål.

To be treated as non-existent.

Species the types of which are not now to be found in the British Museum.

Ectrichodia pictipes, Walk. Cat. Het. viii. p. 45. n. 29 (1873).
—— *pyrophila*, Walk. *loc. cit.* p. 55. n. 60.
—— *geniculosa*, Walk. *loc. cit.* p. 59. n. 74.

SUPPLEMENTARY NOTES.

SALYAVATINÆ.

Lisarda inornata.

Acanthaspis inornata, Walk. Cat. Het. vii. p. 175. n. 51 (1873).
Lisarda pallidispina, Stål, En. Hem. iv. p. 83 (1874).

ACANTHASPINÆ.

Genus PASIRA.

Pasira perpusilla.

Reduvius perpusillus, Walk. Cat. Het. vii. p. 196. n. 50 (1873).

Pasira pusilla.

Reduvius pusillus, Walk. Cat. Het. vii. p. 193. n. 43 (1873).

Clavus, base of corium, a linear spot near centre of apical margin of corium, spots to connexivum, and extreme apices of anterior femora obscure brownish ochraceous.

XLII.—*Notes on the Classification of Teleostean Fishes.*— IV. *On the Systematic Position of the* Pleuronectidæ. By G. A. BOULENGER, F.R.S.

IN the classification of Cuvier, at the beginning of the last century, the presence or absence of spines in the dorsal fin was regarded as of so great importance in the Teleostean fishes that they were primarily divided into Acanthopterygians and Malacopterygians. According to the presence or absence and the position of the ventral or pelvic fins, the latter division was again split up into three groups—Abdominals, Subbrachials, and Apodes. The Gadoids and Pleuronectids were thus brought together as Subbrachial Malacopterygians. When Johannes Müller took up the condition of the air-bladder as a basis for the establishment of higher groups, these Subbrachial Malacopterygians were removed from the Abdominals or Physostomes and placed nearer the Acanthopterygians, but remained associated under the name Anacanthini. And so they have been in most classifications, even modern text-books teaching us that flat-fishes are only modified asymmetrical Gadoids. But any one who will carefully compare the anatomical structure of the principal members of these two families cannot fail to recognize the absurdity of such a conception. The Anacanthini, as defined by Müller, are a purely artificial group, for the recognition of which not even the excuse of external similarity can be adduced.

A step in the right direction had already been made by Cope in 1871 *, followed later by Gill and by Jordan, in separating the flat-fishes as a suborder under the Dumerilian name of Heterosomata, but merely on account of the asymmetry of the skull, and, to quote from the latter author †, persisting to consider the nearest relationship of this suborder to be "probably with the Gadidæ, although the developed pseudobranchiæ and the thoracic fins indicate an early differentiation from the Anacanthine fishes."

Objections to this view were raised by J. T. Cunningham in 1897 ‡, who observed:—"It is a remarkable fact that although the Pleuronectidæ and Gadidæ have generally been considered to be so similar that they have been placed in the same order Anacanthini, the structure and development of the tail described above [heterocercy] occur in the flat-fish, but are entirely wanting in the Gadidæ. In the latter the tail is permanently diphycercal, it is composed of dorsal and ventral rays which are equal in number and size, and, in fact, closely resemble the tail of the extinct Cœlacanthidæ. There can be little doubt that even if the Gadidæ cannot be directly derived from the latter family, they are descended from Crossopterygian Ganoids with diphycercal tails, and have never passed through a heterocercal condition §. Although the structure of the tail in the Gadidæ was briefly and correctly described by Alexander Agassiz in his paper on the development of the tail, he did not attach sufficient importance to it, believing that a very slight apparent up-bending of the termination of the notochord showed the essential similarity in the development of this type of tail with that seen in other Teleosteans. The proper classification of the Anacanthini is yet to be worked out, but there can be no doubt that the Gadidæ and Pleuronectidæ, instead of being closely allied, are very remote from each other in structure and descent."

The latter conclusion had already been reached by Agassiz from the study of fossils. On p. 260 of the fourth volume of his 'Poissons fossiles,' dealing with the curious extinct genus *Macrostoma* (= *Amphistius*), to which I shall have occasion to refer presently, he expresses the opinion that "L'ensemble

---

* Trans. Amer. Philos. Soc. (2) xiv. 1871, p. 458.

† 'Fishes of N. America,' iii. p. 2602 (1898).

‡ 'Science Progress,' (2) i. p. 498.

§ See my remarks on this subject, further on.

bizarre de caractères que présente ce genre me paraît une confirmation éclatante du rapprochement que j'ai fait des Pleuronectes et des Chétodontes, et si l'on fait abstraction des rayons épineux de ces derniers, ou plutôt si l'on considère le peu d'importance que mérite ce caractère dans une famille qui compte des genres conformés comme les *Platax* et les *Psettus*, on ne méconnaîtra pas leur intime affinité. Qu'on ne m'objecte pas la conformation bizarre et irrégulière de la tête des Pleuronectes; car où qu'on les range, ils se distingueront toujours par là de tous les poissons connus."

Somewhat the same suggestion as that of Agassiz was again incidentally made by E. W. L. Holt in 1894 *:—"Messrs. Cunningham and MacMunn find a difficulty in accepting reversion or atavism as an explanation of the ambicolorate condition, in that the hypothetical vertically swimming ancestor of the flat-fish must have had an unpigmented white or silvery ventral surface, as other symmetrical fishes have, whereas completely ambicolorate flat-fish are uniformly pigmented all over. The difficulty certainly arises if we assume that the ancestor really was paler on the ventral region than elsewhere; but is it not equally reasonable to assume a stage of evolution in which the fish resembled such forms as *Platax* or *Dascyllus*, to take instances from families widely separated from each other by systematists? Both forms have high compressed bodies, and in some species, at any rate, of both genera the ventral region is as deeply pigmented as the dorsal. Even in the John Dory (*Zeus faber*), in which the ventral abdominal region is flattened, it is nevertheless rather darkly pigmented, and to me it certainly seems more probable that the Pleuronectidæ of the present day began to take on their asymmetrical characters as compressed and uniformly coloured forms than in the condition of ordinary round fish."

Merely for the sake of completeness would I allude to the suggestion made by Gill in 1887 †:—"I am half inclined to think that the Heterosomatous fishes may have branched off from the original stock, or progenitors of the Tæniosomous fishes [Trachypteridæ]. I shall investigate the subject when I can get the requisite material." Dr. Gill has not published the reasons which made him incline towards such a conclusion, and the position in which he has left the Pleuronectids in his latest classification ‡, with the Anacanthini between them and the Trachypterids, seems to show that the idea of any very close relationship between these two aberrant groups has been abandoned by him [*].

---

* P. Z. S. 1894, p. 488.

† Amer. Natur. xxi. p. 86.

‡ Mem. Nat. Acad. Washington, vi. 1893, p. 137.

In spite of the absence of spines in the fins, the Gadoids offer a combination of characters—closed air-bladder, jugular ventral fins, reduced parietal bones, maxillary excluded from the border of the mouth—which, taken together, indicate descent from the Acanthopterygians, and not from the lower Teleosteans, a conclusion further supported by their relationship to the Blenniids and Trachinids. This being admitted, it follows that the characters which serve to define them as a group are the result of specialization, not primitive. These characters are:—

1. The diphycercal or isocercal [†] termination of the vertebral column. This has often been regarded as a primitive character; but if we accept, as I do, the conclusions of Dollo in his remarkable discussion of the Dipneusti [‡], we cannot hesitate to lay down as an axiom that all Teleosteans are originally descended from heterocercal forms. But the caudal fin may become reduced or disappear, as in the series *Mormyrops–Gymnarchus*, *Urenchelys–Muræna*, *Thyrsites–Trichiurus*, *Pleuronectes–Cynoglossus*, to mention only examples in which the direction of the line of evolution does not seem open to controversy; and if it should reappear, it cannot be again in the specially modified condition known as homocercy. Such a form of secondary caudal fin is exemplified among the Crossopterygians by the Cœlacanthidæ [§]. I have reason to believe that the Gadoids must have been derived from such a group as the Berycidæ, through forms of which the Macruridæ, with thoracic ventral fins composed of 7 to 12 rays, are the nearest known examples, and in which the caudal fin had entirely vanished. I regard the isocercal condition of the Gadidæ as the result of the formation of a new caudal fin, the homocercal extremity of the vertebral column having been lost by the direct ancestors of these fishes.

2. The relations of the bones supporting the pectoral fin, which differ considerably from those of the earlier Acanthopterygians. The scapular bone is imperforate and the fenestra is situated between it and the coracoid. Of the basalia or

---

[*] It is not improbable that the Trachypteridæ have branched off from the hypothecial primitive Acanthopterygians out of which the Berycidæ, Zeidæ, and Macruridæ may be derived.

[†] For definitions of these terms, *cf.* Boulenger, Poiss. Bass. du Congo, p. 7 (1901).

[‡] Mém. Soc. Belge Géol. ix. 1895, p. 79.

[§] *Cf.* Bashford Dean, 'Fishes Living and Fossil,' p. 153, figs. 155 and 156 (1895).

pterygials, two or three are in contact with the coracoid and one or two with the scapula, this being the reverse of what obtains in the Berycidæ and most Acanthopterygians.

3. Absence of pseudobranchiæ.

If we now compare the Pleuronectidæ to the Gadoids, we find that in these three characters they differ from them and agree with the majority of the Acanthopterygians, especially with those which, geologically and morphologically speaking, may be termed the oldest. The tail, whenever a caudal fin is well developed, belongs to the homocercal type (heterocercal in the embryo), with comparatively few rays (20 or less). The pectoral fin, in its fullest development, is supported by four pterygials, of which three are attached to the scapula and one to the coracoid, and the fenestra is in the scapular bone. Pseudobranchiæ are present.

From a consideration of these characters alone, the Pleuronectidæ cannot be held to have been derived from the Gadoids, but their ancestors must be sought for among more primitive Acanthopterygians. Bearing in mind Holt's suggestion quoted above, I have proceeded to make a search among the deep-bodied, strongly compressed types, such as the so-called Squamipinnes and some of the Scombriformes. I may mention that in seeking for extinct allies of the Zeidæ I had already arrived at the conclusion that a form placed among the Carangidæ by Woodward*, *Amphistium*, agreed very closely with them in the structure of the vertebral column, notwithstanding the lower number of vertebræ (10 + 14); its caudal fin, quite similar to that of the Zeidæ, precluded its reference to the Carangidæ, and a careful examination of one of the specimens preserved in the British Museum, kindly placed at my disposal for study by Dr. A. S. Woodward, convinced me that as many as eight branched rays in addition to a spine are borne by the pelvic bone—this, of course, affording a confirmation of the supposed affinity with the Zeidæ. The latter differ from all other Acanthopterygians, except the Berycidæ, Macruridæ, and various Gadidæ, in having more than five (6 to 8) articulated rays to the ventral fin—an important character, indicative of descent from a lowly type, for I am not disposed to admit that the number of rays on one bony support having once been reduced can again become multiplied. We know, in the evolution of the dorsal and anal fins, that the exoskeletal rays, having first been in excess of their endoskeletal supports (interspinous bones), became reduced so as to correspond with them in number; and there is no example of their having again increased in number except concurrently with a multiplication of their supports.

---

* Cat. Foss. Fish. iv. p. 434 (1901).

The Zeidæ or Cyttidæ, comprising the genera *Zeus*, *Zenion*, and *Cyttus*, to which I would add the little-known *Grammicolepis*, described by Poey and by Shufeldt[*] from a single specimen, have been placed by some authors near the Chætodontidæ, by others with the Scombriformes or with the Beryciformes. They form a perfectly natural family, which may be defined as follows:—

Acanthopterygians without subocular shelf or suborbital stay for the præoperculum, with double basis cranii[†], well developed entopterygoid, and strongly protractile præmaxillaries. Two nostrils on each side. Gill-membranes free from isthmus; 7 or 8 branchiostegal rays; gills 3½; pseudobranchiæ well developed. Lower pharyngeal bones separated. Vertebræ 30 to 46, the anterior with sessile ribs, the posterior præcaudals with long neural spines bent forwards and with transverse processes directed downwards, forming hæmal arches and bearing the ribs at their extremity; epipleurals much reduced or absent; hypural large, without the basal spine present in most Perciformes and all Scombriformes and Percecoces, bearing fewer than 20 rays. Dorsal and anal fins elongate, the former with a distinct spinous portion, the latter with 1 to 4 spines detached from the soft portion. Pectoral fin supported by four pterygials, of which three are in contact with the perforated scapular bone; posttemporal forked and solidly attached to the skull. Ventral fin with 1 spine and 6 to 8 soft rays.

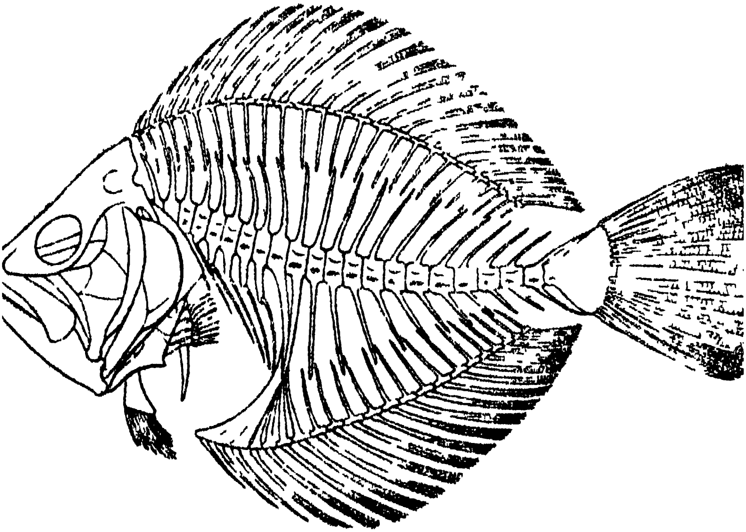
The family which I propose to name Amphistiidæ, with the single genus *Amphistium*, Ag. (*Macrostoma*, Ag.), from the Upper Eocene, agrees with the Zeidæ in all characters that can be ascertained on the preserved remains, except that the vertebræ are fewer (24), the spines of the vertical fins are reduced to a few adnate to and continuous with the series of soft rays, and the scales are more normal and imbricate.

Now, as already pointed out by Agassiz, these Amphistiids, provided they be possessed of the last half-gill absent in the Zeidæ, and this is a character which unfortunately cannot be ascertained on the fossils, appear to realize in every respect the prototype of the Pleuronectidæ before they had assumed the asymmetry which characterizes them as a group. I am fully convinced that if they do not actually form part of the ancestral group out of which the flat-fishes were evolved, they are very nearly related to them; and it follows that the Zeidæ, of which our familiar John Dory is the best-known representative, are the nearest known living allies of the Pleuronectidæ. The number of vertebræ in *Amphistium* is

---

[*] Journ. of Morphol. ii. 1888, p. 271.

[†] I am unable to confirm the statement made by Starks (Proc. U.S. Nat. Mus. xxi. 1898, p 470), that the basisphenoid is absent and that the parietals unite in front of the supraoccipital.



Restoration of *Amphistium paradoxum*, Ag., from the Upper Eocene.

rather in favour of than against such a view, since the least specialized of living Pleuronectidæ, *Psettodes* *, agrees with it in this respect, all other forms of which the skeleton is known having 28 or more. Although it is perfectly true that in a general way the number of vertebræ has become reduced in the course of evolution, this law certainly does not apply to the particular groups, as seems to me proved by such series of forms as we know in the Siluridæ, Scombriformes, and especially in this instance, where the increased number is evidently related to the undulatory swimming movements of these fishes.

---

* In which the eye of the blind side is not lateral, but on the dorsal surface of the head, the dorsal fin does not extend on the head, the mouth is large and symmetrical, and the pelvic bones and fins are placed as in a normal Perciform.

D. S. Jordan regarded a high number of vertebræ, other things being equal, as indicative of generalization, and even thought the Pleuronectidæ afforded support to this view. Not aware of the state of things in the Hippoglossine *Psettodes*, he wrote *:—"Thus in the comparatively primitive subfamily of Hippoglossinæ, the halibut group, the division nearest the cod-like stock from which the flounders are probably descended, the numbers range from 35 to 50. In the turbot group (Psettinæ) from 31 to 43." I have gradually arrived at the conclusion that Jordan's theory cannot be applied to the various groups which make up the suborder Acanthopterygii, and that the explanation of the fact that so many of its marine members agree in having 24 vertebræ is due to common descent from a Cretaceous marine type, probably Berycid, in which the number had been thus reduced. Further evolution would again have tended to an increase of the segments, especially in freshwater, deep-sea, and pelagic forms, for physiological requirements, which, however, are not always clearly apparent. The "natural selection" theory, by which Jordan has endeavoured to explain the variability in the number of vertebræ within restricted groups, can have no further claim than that of ingeniousness, since it implies a reversion of the evolution-lines that can be followed in the minor groups of the Pleuronectidæ, especially the Hippoglossinæ and Soleinæ.

Another good reason for regarding the Amphistiidæ and Zeidæ as related to the ancestral type of the Pleuronectidæ is the fact that the ventral fin of the latter, although always much reduced, contains frequently as many as six articulated rays, sometimes with the addition of a simple ray (*Hippoglossus*).

I therefore propose the establishment of a division of the suborder Acanthopterygii, under the name of **Zeorhombi**, to be defined as aberrant, strongly compressed Perciformes, with very short præcaudal region, modified in the direction of the flat-fishes, and characterized by the combination of an increased number (7 to 9) of ventral rays, with absence of hypural spine (by which Berycidæ are excluded), *or* by asymmetry of the skull in the forms in which the spine of the ventral fin has been lost.

This division embraces three families only:—

---

* 'Temperature and Vertebræ: a Study in Evolution' (Ithaca, 1893), p. 25.

A distinct spinous dorsal fin; anal spines detached from the soft portion; a ventral spine; gills three and a half, three slits between them....	1. **Zeidæ.**
Dorsal and anal spines few, continuous with the soft rays; a ventral spine..	2. **Amphistiidæ.**
No spines; cranium twisted in front, with the two orbits on one side; gills four, a slit behind the fourth	3. **Pleuronectidæ.**

According to our present information the three families can be traced back to the Upper Eocene. The common ancestors of the Zeidæ and Amphistiidæ will probably be found in the Upper Cretaceous associated with the Berycidæ, to which they will no doubt prove to be related *.

It is fair that I should add that the idea of deriving the Pleuronectids from some form similar to *Zeus* had occurred to Mr. E. W. L. Holt some years ago. He had been so struck by the asymmetry in the number and arrangement of the dorsal and anal bony plates in the young of the John Dory that he induced his friend Mr. L. W. Byrne to examine the matter on a large number of specimens between 2¾ and 5 inches in length, captured by Plymouth trawlers. This study, which I hope Mr. Byrne may soon publish, demonstrates the large proportion of specimens with an asymmetrical arrangement of the plates and the apparent tendency to vary especially in the direction of an asymmetry in which the plates of the right or of the left side predominate. It is a pity that so little should be known of the habits of the John Dory, in view of the suggestion put forth a few years ago by Verrill †, when dealing with the sleep of some Labridæ, first observed by Möbius ‡. "The common Tautog or Blackfish (*Tautoga onitis*)," says Verrill, "has the curious habit of resting upon one side, half buried among gravel, or partly under stones, and is often curved in strange positions. It is easy to imagine that the flounders originated from some symmetrical ancestral form that acquired, like the tautog, the habit of resting upon one side, at first only when sleeping, but afterwards continually, owing to the greater protection that this habit and its imitative coloration afforded. The one-sided coloration and the changes in the position of the eyes, etc., would gradually follow in accordance with well-known laws of evolution."

---

* On the ground of the number of ventral rays the Zeidæ have been brigaded with the Berycidæ by Woodward (Cat. Foss. Fish. iv. p. 384).

† Amer. Journ. Sci. (4) iii. 1897, p. 136.

‡ Zool. Garten, 1867, p. 148.

Mr. Byrne, who has seen *Zeus* alive at Plymouth, informs me that it does not live well in an aquarium and has not been observed to "sleep," but that it swims in a lop-sided fashion, at any rate in captivity, and also seems to use the soft dorsal and anal fins as organs of propulsion, moving them in waves, much as a needle-fish does.

XLIII.—*A new Arrangement of the existing Species of* Equidæ, *with the Description of a new Subspecies of* "*Zebra.*" By R. I. Pocock.

It is customary to classify existing Equidæ as Horses, Asses, and Zebras.

The genus *Equus*, Linn. (Syst Nat. ed. x. 1766), originally contained *E. caballus* (the domestic horse), *E. asinus* (the domestic ass), and *E. zebra* (the mountain zebra, with which Linnæus included the quagga).

In 1825 Gray (Zool. Journ. i. p. 241) established the genus *Asinus* for *E. vulgaris* (=*asinus*), *E. zebra*, *E. quagga*, and *E. Burchelli*. In other words, he divided the Equidæ into "Horses" and "Asses."

Hamilton Smith went a step further, and removed from Gray's genus *Asinus*, under the name *Hippotigris*, *H. zebra*, *H. quagga*, *H. Burchelli*, and added *H. antiquorum*, leaving *Asinus* for the African and Asiatic species of wild ass (Nat. Libr., Mamm. i. pp. 350–351). This classification expresses in technical language the prevalent notion as to the affinities of the species included, although generic value has been seldom accorded to the three groups. It was adopted nevertheless by Trouessart in 1898 (Cat. Mamm. ii.), *E. Grevyi* and a number of subspecific forms of *E. Burchelli* being included under *Hippotigris*.

Zebra is no doubt a convenient vernacular term for the striped as opposed to the unstriped species of Equidæ; but its technical equivalent *Hippotigris*, in the broad sense used by Hamilton Smith and the still broader application given to it by Trouessart, cannot, I think, be maintained as symbolizing a natural unit.

There is a mass of evidence favouring the view that the ancestors of *Equus* were striped. In that case the stripes of "zebras" are a heritage from a common ancestor. To that extent only are they a sign of affinity between the species which possess them. They have been retained where the physical conditions required their retention for purposes of concealment, and lost where their suppression was demanded for the same object. Their slight systematic importance is shown by their extreme variation within the limits of the group termed "Burchell's zebras"—a group composed of forms admittedly related to one another. Their disappearance in such forms as the African "asses" (*E. tæniopus* and *somaliensis*) and Asiatic "asses" (*E. hemionus, onager*, and *hemippus*) is in itself no proof of kinship close enough to justify the union of these two sections of the Equidæ into a group equivalent to one embracing the striped species.

The stripes of the Equidæ in fact appear to be strictly comparable to the stripes or spots of the Felidæ and to have much the same taxonomic value. No one, presumably, would feel justified in establishing a genus for the tawny or fawn-coloured cats, like the lion, puma, caracal, jaguarundi, &c., on the strength of their uniform coloration, and another for those species of *Felis* in which the primitive variegated markings persist.

Rejecting, then, for these reasons the suppression or retention of body-stripes as a basis for the classification of those existing species of Equidæ which have warts only on the fore legs, a short erect mane, and a tufted tail, I think these species may be classified under the following headings:—

1. GRÉVY'S ZEBRAS (*Equus Grevyi*).—One species with the two subspecies described below.

That Grévy's zebra stands apart from the other striped species has been already pointed out (Ann. & Mag. Nat. Hist. (6) xx. pp. 48–49, 1897). The arrangement of stripes on the hind-quarters is unique; the warts on the fore legs are abnormally small, and the extension of the mane over the withers sharply differentiates this species from those of the following section, to which *E. Grevyi* is commonly supposed to be nearly related. Lastly, the widely expanded rounded ear is quite peculiar and contrasts forcibly with the longer or shorter, but narrow, fusiform, and pointed ear of other Equidæ.

2. AFRICAN WILD ASSES and MOUNTAIN ZEBRAS (*Asinus*).
   - a. *E. asinus.*
     - *α.* Subsp. *tæniopus.*
     - *β.* „ *somaliensis.*
   - b. *E. zebra.*
     - *α.* Typical subspecies.
     - *β.* Subsp. *Hartmannæ.* } Perhaps identical.
     - *γ.* „ *Penricei.* }

Apart from the retention of the stripes and the unique character of the reversal of the spinal hairs, the mountain zebras seem to differ but little from the African wild asses. In general form, shape of head, length of ear, and narrowness of hoof the two species are strikingly alike. As contrasted with what obtains in the following group, there is a marked tendency of the stripes to persist upon the legs in the species that have lost them on the body.

3. QUAGGAS (*Hippotigris*).—One species (*E. quagga*), with many subspecies.

α. Typical subspecies, now extinct.
β. Subsp. *Burchelli.*
γ. „ *antiquorum.*
δ. „ *Wahlbergi.*
ε. „ *Chapmani.*
ζ. „ *Selousi.*
η. „ *Crawshayi.*
θ. „ *Granti.*
etc., etc.

The validity of this group must, I think, be admitted. The true quagga is generally set apart as an isolated species, displaying less similarity to Burchell's zebra than the latter shows to the mountain zebra. Judging, however, from extant figures and the few specimens of *E. quagga* preserved in museums, considerable individual variation was exhibited in the extent to which the stripes on the flanks and hind-quarters were suppressed. Even in the extremest cases of suppression the difference between *E. quagga* and the typical *E. Burchelli* is less pronounced than that between the latter and the subspecies known as *Crawshayi* or *Granti* *.

The quaggas furnish an admirable object-lesson in subspecific forms. Broadly speaking, the most fully striped forms occur to the north of the Zambesi, both Grant's quagga, which inhabits Southern Abyssinia and British East Africa, and Crawshay's quagga, from British Central Africa (Nyasaland), being strongly striped to the hoofs and banded to the middle line on the belly. Nearest to these comes Selous's quagga, from Mashonaland, which, however, has paler narrow intermediate stripes, at least on the hind-quarters. From this form a complete series of gradations may be found in which the stripes gradually die away from the hoofs upwards, ultimately leaving the belly, legs, and hind-quarters up to the last flank-stripe unstriped. This suppression of stripes on the limbs and belly is accompanied by an increase in the number and forward extension of the shadow-stripes, the consummation in both particulars being reached, so far as existing types are concerned, in Burchell's quagga. In the true, but now extinct, quagga the process was carried one step further, the stripes being suppressed over the quarters, and the shadow-stripes, at least apparently in some cases, showing a great increase in development, the result being a more uniform coloration of the fore part of the body and head. It would be extremely interesting to discover why these quaggas, as they passed from north to south in Africa, found it advantageous to drop the stripes on their limbs and hind-quarters. The answer to this question could probably be given by a careful study of the physical conditions under which each subspecies exists.

---

* The adoption of the term "quagga" for this group will be followed by the advantage of enabling us to speak of these subspecies as Crawshay's or Grant's quagga, instead of Crawshay's Burchell's zebra, Grant's Burchell's zebra, &c.

4. ASIATIC WILD ASSES (? *Equus*, s. s.).—Certainly one well-marked species, *E. hemionus*, with the subspecies *onager* and *hemippus*. Possibly the Horses should be here included, if *E. Przevalskii* be a valid species.

As the quaggas are the most equine of the "zebras," so the kiang is the most equine of the "asses."

The question as to whether there is a genuine wild species of true horse is still *sub judice*. If the verdict be adverse, the horse as a domesticated animal, artificially modified to an unknown extent, has no place in a system dealing with existing species. Assuming for the moment that Przewalski's horse is not feral and not a hybrid, it must take its place at the end of the series given above, probably, I think, as a second species under section 4.

In the specimens of this animal in the Zoological Gardens, as in the original type, the hairs on the basal half of the tail are much shorter than those at the end. The tail, in fact, presents an intermediate stage between that of *E. caballus* and of *E. hemionus*. Similarly, the mane of the kiang exhibited in the Gardens is almost as much "equine" as "asinine" in character. Moreover, considering the extent to which the warts on the hind legs vary in size in domesticated horses, it would be rash to give more than a specific value to their presence.

Finally, if the kiang be united to the true horses, as proposed by Mr. Lydekker[*], it will be seen that of the four groups into which the existing Equidæ fall three have received generic names. If in the future these be restored to use, a fourth name must be given to *E. Grevyi*, which is perhaps the best-marked type of all; and I am inclined to think that if the genus *Equus* be subdivided, a classification which placed *E. Grevyi* in one category and the rest of the species in another would not be far wide of the mark.

The original example of Grévy's zebra was sent from Abyssinia by the Emperor Menelik to the then President of the French Republic, after whom it was named by Oustalet ('La Nature,' x. p. 12, 1882). Specimens of apparently the same species were subsequently received in this country from Somaliland, and were unquestionably considered to be identical with the Abyssinian form, of which no topotypical examples were available for comparison. Within the last few years, however, several living Abyssinian specimens, presented by Menelik to our English Sovereigns, have been exhibited in the Gardens of the Zoological Society. These zebras differ strikingly from those obtained in Somaliland which have been sent to the British Museum in their staring black-and-white coloration.

That the type of the species upon its arrival in Paris resembled the specimens afterwards sent by Menelik to this country is attested by Oustalet's description of the stripes as "purple-brown tending to black, standing boldly out on a white ground scarcely washed with grey."

Since, then, the available evidence points to a constant difference in coloration between the Abyssinian and Somali Grévy's zebras, the latter must be regarded as a distinct subspecies[†].

The two may be diagnosed and contrasted as follows:—

a. Stripes black, interspaces white and of approximately the same tone as the white of the belly	Typical subspecies.
b. Stripes dark brown, interspaces washed with ochre-brown and very noticeably darker than the white of the belly	Subsp. ***berberensis***, nov.

The type of *E. Grevyi berberensis* is the skin of a specimen shot by Capt. Swayne at Duhri, Ogardain (B.M. Reg. 94. 2. 21–1).

---

[*] 'Nature,' vol. lxv. pp. 103 & 104 (1901).

[†] A form of Grévy's zebra from Lake Rudolf has been described by Dr. P. Matschie (SB. Ges. naturfor. Berlin, 1898, pp. 169 & 180) as *Equus Faurei*. See also Camerano, Atti Acc. Torino, vol. xxvii. 1902, where another form of "quagga" is described as *E. Chapmani* [illegible].

XLIV.—*On the East-African Representative of the Bongo and its Generic Position.* By OLDFIELD THOMAS, F.R.S.

FOR some years the presence of a large Tragelaphine antelope in the district of the Ravine Station, British East Africa, has been recorded, and guesses made as to its identity with species known elsewhere. In 1897 Mr. F. J. Jackson sent home a pair of horns, with certain native information about them which now proves to be remarkably correct; and these horns were figured by Mr. Sclater in the 'Proceedings of the Zoological Society'[*], with the suggestion that they might be the horns of *T. Angasi*.

Now at last the mystery is cleared up by Mr. F. W. Isaac, who has obtained through the natives, and presented to the National Museum, a remarkably fine series of this antelope, which proves to be not the Inyala, but a close ally of the Bongo, hitherto only recorded from West Africa.

The most noteworthy point about Mr. Isaac's series is the definite proof they give that this animal, belonging to a group with the females normally hornless, has long horns in that sex—a character fully of generic importance. Gray's distinction of the genus "*Euryceros*" [†], supported alone of recent writers by Dr. Jentink, therefore proves to have been correct. But the name *Euryceros*, being preoccupied [‡], will require to be changed, and I would suggest that of *Boocercus*, based on the characteristic bovine tail of *B. eurycerus*.

No evidence as yet exists as to whether the true western Bongo has horns in the female, no examples of that sex, horned or hornless, being in any European museum. But should it prove, contrary to all probability, that there are no horns in the West-African females, I would expressly assign as the type of the genus *Boocercus* the East-African form which we know to possess them.

This East-African form, so far as there is western material for comparison with Mr. Isaac's fine set, appears to be very closely allied to the true Bongo, but may be subspecifically distinguished as follows:—

Boocercus eurycerus Isaaci, subsp. n.

Closely similar to the true *B. eurycerus*. Size very large; skull of male considerably larger and heavier than that of the type form (see measurements below), strongly convex above, with much arched frontals and swollen nasals. Tooth-row about half an inch longer than in the ally. Bony projections on base of skull between anterior end of bullæ much larger and more prolonged—in *B. eurycerus* they do not extend backwards between the bullæ at all. Bullæ larger, rounder, and more inflated, those of the female still more developed than those of the male.

---

[*] P. Z. S. 1897, p. 455.

[†] P. Z. S. 1850, p. 144.

[‡] Lesson, Cent. Zool. p. 217 (1830).

Horns of male very thick and massive, apparently decidedly thicker at all ages than in true *eurycerus*; the angles rounded and but little marked; the surface rough and coarse, not worn smooth, as is commonly the case in the allied form; dark blackish brown, the tips white. Horns of female proportionally rather longer than in the male, slender, rounded, more closely twisted than in the male, and with about half a turn more; their general direction more nearly parallel to each other, about as in the Lesser Kudu.

Markings quite as in the typical form, but the general colour seems to be a stronger and richer fulvous. Muzzle prominently black. Dorsal line, from the withers backwards, marked with black, except where the continuations of the lateral vertical lines cut it with white. White flank-lines about ten to thirteen in number.

Measurements of the typical skull (♂):—

Basal length 394 millim.; greatest breadth 167; top of nasals from palate 137; nasals 148 × 52; muzzle to orbit 235; muzzle to front of anterior premolar 123; palate length 223; combined length of three premolars 51, of tooth-row 126.

Horns: length round curves 870 millim. (=34¼ inches); in straight line 725 millim. (=28½ inches); circumference at base 286 millim. (=11¼ inches); greatest spread (outside) 455 millim. (=18 inches).

A female skull has a basal length of 350 millim., and its horns measure 686 millim. (=27 inches) round the curves, 615 millim. (=24¼ inches) in a straight line, with a basal circumference of 177 millim. (=7 inches) and a greatest spread of only 227 millim. (=9 inches).

Hab. Eldoma Ravine, British East Africa. In deep forest.

Type. Adult male. Collected April 1902, and presented by F. W. Isaac, Esq.

Mr. Isaac is to be congratulated on the satisfactory way in which he has cleared up the problems in connexion with this magnificent inhabitant of our East-African territories.

XLV.—*On some new Forms of* Otomys.

By OLDFIELD THOMAS.

IN the fine collection of mammals from Deelfontein, Cape Colony, prepared by Troopers Grant and Seimund, and presented to the National Museum by Col. A. T. Sloggett, R.A.M.C., there are a number of *Otomys* belonging to three species, and in working these out certain other members of the genus prove to need description.

The Deelfontein species are (1) *Otomys Brantsii*, A. Sm., (2) a local subspecies of *O. unisulcatus*, and (3) a new species allied to the last-named. This may be described as follows:—

Otomys Sloggetti, sp. n.

Essential characters of incisors, molars, and bullæ as in *O. unisulcatus*. Size less than in that animal. Fur soft, fine and thick. General colour of upper surface vinaceous brown, like the most strongly vinaceous specimens of *O. unisulcatus*. Sides gradually becoming dull buffy, and this passes without line of demarcation into the colour of the under surface, which is uniformly soiled buffy, with slaty bases to the hairs, from chin to anus. Head greyish brown, without vinaceous, contrasting markedly with the back. Eyes with narrow buffy lids. Ears not large, their hairs mixed brown and buffy, with a narrow darker edging at the backs of their anterior margin. Hands and feet small and lightly built, their upper surfaces clear buffy. Tail thin, short, finely haired, markedly less hairy than in *O. unisulcatus*, dull buffy below and on the sides, blackish, darkening terminally, along a narrow line on the top.

Skull smaller than that of *O. unisulcatus*, but closely similar in its proportions. Palatal foramina not widely open. Posterior nares narrow. Bullæ slightly larger than in true *unisulcatus*.

Upper incisors with one well-defined groove near the outer edge, but not quite so close to the edge as in *unisulcatus*, the broader portion about twice instead of about three times the breadth of the narrow. Lower incisors as in *O. Brantsii*, with one indistinct groove on each.

Dimensions of the type (measured in the flesh):—

Head and body 184 millim.; tail 68; hind foot (s. u.) 22·5; ear 19.

Skull: greatest length 35; basilar length 28; zygomatic breadth 18·5; nasals, length 14; interorbital breadth 4·3; interparietal 8·8 × 8; palate length 16·6; diastema 9·2;

palatal foramina 7; length of bulla 8·1; length of upper molar series (crowns) 6·7.

Hab. Deelfontein, Cape Colony.

Type. Adult female. B.M. no. 2. 9. 1. 61. Original number 215. Collected 1st April, 1902. Presented by Col. Sloggett. Two specimens.

This animal at first sight looks like a small *O. unisulcatus*, but may be distinguished by its differently coloured head, its short, slender, thinly haired, and pale-coloured tail as compared with the comparatively long well-haired black tail of that species, and by the presence of indistinct grooves on its lower incisors, those of *O. unisulcatus* being quite smooth.

In Mr. de Winton's notes on the species of *Otomys** two names, *pallida* and *rufifrons*, have been placed under *O. unisulcatus*, but have apparently been transposed from the synonymy of *O. Brantsii*, to which they both unquestionably belong. The description of the second of them, *O. rufifrons*, agrees in some respects with *O. Sloggetti*, but fits still better an immature *O. Brantsii*, in which the normal yellowish colour of the upper surface is as yet only present on the head. In *O. Sloggetti* the head is greyer, not more yellowish, than the body.

Otomys unisulcatus Grantii, subsp. n.

Like true *O. unisulcatus* in all respects, but the grooves on the upper incisors, which are clear and distinct in that animal, shallow and faint, and in some specimens hardly distinguishable at all.

General colour of the same grizzled greyish brown, with a slight tinge of vinaceous, and all other colour-characters as in *unisulcatus*. The feet, however, are rather clearer yellowish. Tail long, heavily haired, black; greyish proximally below.

Dimensions of the type (measured in the flesh):—

Head and body 166 millim.; tail 118; hind foot (s. u.) 27; ear 23.

Skull: greatest length 39·5; basilar length 33; zygomatic breadth 21·3; nasals 17 × 5·5; interorbital breadth 5; interparietal 5·2 × 8·5; palate length 18·5; diastema 10·5; palatal foramina 8; length of upper molar series (crowns) 8; length of bulla 7·6.

Hab. Deelfontein, Cape Colony.

Type. Old male. B.M. no. 2. 9. 1. 50. Original number 127. Collected 13th February, 1902, by C. H. B. Grant, and presented by Col. Sloggett. Seventeen specimens examined.

---

* Ann. & Mag. Nat. Hist. (7) ii. p. 5 (1898).

All the examples of the *O. unisulcatus* group hitherto seen have the grooves on the upper incisors clear and well defined, but the series from Deelfontein have these grooves shallow and indistinct, and in some cases (*e. g.*, no. 2. 9. 1. 52) they are scarcely or not perceptible at all to the naked eye. This would seem to be a local peculiarity worthy of a subspecific name.

Otomys Broomi, sp. n.

Size and tooth-characters of *O. unisulcatus.* General colour far paler, the back between "drab-grey" and "drab" of Ridgway. Sides greyer and passing evenly into the pale whitish buffy of the tips of the belly-hairs. Long bristle-hairs of rump unusually numerous, broadly tipped with whitish. Face like back; eye-rings not marked in the general pale colour. Ears very large, their surface covered inside and out with short pale buffy hairs; the long hairs at their anterior base broadly tipped with whitish; postauricular patch large and prominent, dull whitish. Upper surface of hands and feet pale yellowish white. Tail long, thickly haired, dark brown above (in one specimen scarcely darker than the back), dull white on sides and below.

Skull as in *O. unisulcatus*, with clear and well-defined incisive grooves, but the bullæ, in correlation with the large external ears, are also perceptibly larger than in that species, although nothing like the huge swollen bullæ of *O. Brantsii.*

Dimensions of the type (measured in the flesh):—

Head and body 159 millim.; tail 102; hind foot (s. u.) 28; ear 27.

Skull: greatest length 35; basilar length 28·5; zygomatic breadth 18·2; nasals 14 × 4·7; interorbital breadth 4·6; interparietal 4·4 × 7·5; palate length 16·4; diastema 8·2; palatal foramina 6·5; length of upper molar series 7·5; length of bulla 8 (in second specimen 8·2).

Hab. Port Nolloth, Little Namaqualand.

Type. Female. B.M. no. 98. 9. 3. 4. Collected 25th March, 1897, and presented by Dr. R. Broom. Two specimens.

This animal is evidently a pallid desert representative of *O. unisulcatus*, with the enlarged ears so commonly found in desert animals. I have great pleasure in naming it after its captor, to whom the National Museum is indebted for some very interesting and valuable Namaqualand animals.

Otomys irroratus tropicalis, subsp. n.

The northern strong-coloured form of *O. irroratus*, with seven laminæ to the last upper molar.

Size slightly larger than in *O. irroratus*. General colour deep brown, nearest to "vandyke-brown" of Ridgway, very different therefore to the grizzled grey of true South-African *irroratus*. In each case the colour varies considerably, but the general tone seems always darker in the northern animal. Sides clearer brown. Belly slaty, with the tips of the hairs buffy; in *irroratus* they are comparatively clear grey. Sides of muzzle dark fulvous. Eyes without lighter rings. Ears of medium length, well-haired, rather paler than the head. Upper surface of hands and feet dark brown, the digits darker than the metapodials. Tail less than half the length of the head and body, well-haired, broadly black above, dull whitish below.

Skull apparently much as in true *irroratus*, but the nasals, though very variable, tend to be more broadly expanded anteriorly, and the interorbital space is commonly narrower. Teeth as in *irroratus*, but the last upper molar with seven laminæ.

Dimensions of the type (measured in the flesh):—

Head and body 195 millim.; tail 93; hind foot (s. u.) 30; ear 23.

Skull: greatest length 43·5; basilar length 35; zygomatic breadth 21·7; nasals 18 × 7·5; interorbital breadth 3·3; palate length 19·5; palatal foramina 8·2; length of upper molar series (crowns) 8·5; length of bulla 7·2.

Hab. Eastern Tropical Africa, from British East Africa to Nyasaland. Typical locality, western slope of Mt. Kenya, British East Africa. Altitude 10,000 feet.

Type. Old male. B.M. no. 0. 2. 1. 20. Collected 22nd August, 1899, by Mr. H. J. Mackinder.

The difference in general colour and in the number of molar laminæ between northern and southern specimens of this group has long been known, and it is quite time that a name should be applied to the former. Examples from Mashonaland vary in the number of the laminæ, and for this reason I do not at present distinguish the East-African form as a species, but only as a subspecies. The Mashona skins are distinctly southern so far as colour is concerned, while Nyasa ones are clearly northern.

XLVI.—*Some new African Spiders.*

By R. I. Pocock.

Fam. **Aviculariidæ.**

Genus Scodra, Becker.

Scodra Batesii, sp. n.

♂.—*Colour* of the upper and underside of cephalothorax and abdomen and of underside of legs and palpi like that of *S. brachypoda* and *griseipes*, there being a large blackish patch at the distal end of the femur, two, divided by the converging white stripes, on the patella, a single undivided median stripe on the proximal half of the tibia, one on the protarsus and on the tarsus, all these spots being of equal intensity, whereas in *S. brachypoda* and *griseipes* the protarsal and tarsal spots are much deeper than the others.

Carapace slightly longer than femur of first, slightly shorter than that of fourth leg, as long as patella + $\frac{3}{4}$ the tibia of the palp, also as tibia + tarsus of palp; slightly longer than tibia, slightly shorter than protarsus of fourth leg; as long as tibia + $\frac{1}{2}$ patella or as protarsus + $\frac{1}{2}$ tarsus of first.

Legs 4, 1, 2, 3, fourth exceeding first by more than the length of its tarsus, the fourth four times as long as the carapace, the first less than three and a half times as long; protarsus of first with its upper surface level, as in *S. brachypoda*, not depressed in its basal half, as in *S. griseipes*, but furnished below at its proximal end with a tuft of long silky hairs, as in *S. griseipes*, arising from a basal rounded tubercular excrescence, somewhat as in *S. griseipes*, except that in the latter the inferior excrescence or swelling corresponds to the superior depression.

Palpus long, slightly surpassing the tibia of the first leg and exceeding twice the length of the carapace by its tarsus; palpal spine lightly concavo-convex, as in *S. brachypoda*, but a little stouter, blunter, and separated from the bulb at the base posteriorly by a distinct notch, much like that of *S. griseipes*.

Measurements in millimetres.—Total length 31; carapace 14; palpus 31; first leg 49, second 48, third 44, fourth 56 (all from base of femur); patella + tibia of first 17·5, of fourth 20; protarsus + tarsus of first 18, of fourth 22.

Loc. Efalen, 1500–1800 feet alt., 70 miles from the Congo coast (*G. L. Bates*).

The males of *S. calceata* and *S. fumigata* are unknown to me; but the type of this new species differs from the females, and no doubt also from the males, of these two forms at least in the coloration of the underside of the anterior legs and palpi. The points in which it differs from the males of the other known species may be summarized as follows:—

a First leg long, longer than the fourth, nearly four times as long as the carapace (14½ : 55), its femur slightly longer than carapace, its patella+tibia longer than, and protarsus+tarsus about equal to, those of fourth; palpus scarcely surpassing its middle; (protarsus of first sinuous, with inferior silky tuft of hairs) .... *griseipes.*

b. First leg short, shorter than fourth, less than three and a half times as long as carapace, which slightly exceeds its femur; its patella+tibia and protarsus+tarsus less than those of fourth; palpus considerably surpassing its middle.

  *a*¹. Legs strongly spotted; palpus long, slightly surpassing tibia of first leg, its patella+tibia considerably longer than carapace, which equals its tibia+tarsus; fourth leg four times as long as carapace, which is equal to its tibia and less than its protarsus; protarsus of first with basal inferior tuft of silky hairs and tubercular excrescence .... *Batesii*

  *b*¹. Legs weakly spotted except on protarsus and tarsus; palpus short, falling short of tip of tibia of first leg, its patella+tibia equal to its tibia+tarsus, much shorter than carapace; fourth leg much less than four times as long as carapace, which exceeds its protarsus; protarsus of first without inferior proximal silky tuft and tubercular excrescence .... *brachypoda.*

Genus HARPACTIRA, Auss.

Harpactira Hamiltoni, sp. n.

♂.—*Colour* greyish mouse-brown, with silky golden lustre; carapace black, clothed with golden-yellow hairs, showing a definite radial arrangement; sternum and coxæ blackish; hairs on underside of femora foxy red.

Carapace a little shorter than patella+tibia of first leg, equal to those of fourth.

Tibial apophysis of first *leg* not straight, but somewhat strongly bent or geniculate, its basal half on the outer side showing a deep notch; protarsus of first leg with its outer surface convex, its inner surface concave, armed distally below with a high tuberculiform prominence. Spine of palpal organ stouter and more strongly curved than that of *H. tigrina* and *curator*.

On the external side of the *mandible* the inferior row of stridulating-spines forms a single series close to the oral fringe.

Measurements in millimetres.—Total length 26; carapace 13; palpus 20; first leg 40, second 36, third 31, fourth 42; protarsus + tarsus of first 14, of fourth 17.

A female referred to this species gives the following measurements:—Total length 33; carapace 15·5; palpus 23; first leg 36, second 32, third 29, fourth 39; patella + tibia of first 14, of fourth 13; tarsus + protarsus of first 10·5, of fourth 14·5.

Loc. Vredefort Road, Orange River Colony (*Capt. Barrett-Hamilton*).

The male of this new species differs very markedly from that of the other species known to me in the shape of the tibial apophysis of the first leg, the curvature of the protarsus, and the size of its distal tubercle beneath. The female is very like that of *H. gigas*, Poc., from the Transvaal, but is much smaller.

Mr. G. P. Staunton has also recently sent me specimens of *H. Hamiltoni* from Durban.

Fam. Dipluridæ.

Genus BRACHYTHELISCUS, nov.

Allied to *Brachythele*, Auss., but differing in having the tibia of the first leg simple, armed with strong spines, but without a spur. The tarsus of the palp is short and truncate.

Type *B. bicolor*, Poc. (Proc. Zool. Soc. 1897, p. 735) (*Brachythele*).

The type of this genus was based upon a single mutilated female example collected by Mr. H. A. Spencer at Durban. Being acquainted only with the female, I was not able to separate the species from those of the genus *Brachythele*. The discovery of the male by Mr. G. P. Staunton has, however, shown that the species differs from the typical species of *Brachythele* in the absence of a tibial spur on the first leg in the male.

In both males and females the abdomen is spotted or banded above.

The male has long and slender legs; the protarsus of the first is armed beneath with 1, 1 spines, of the second with 2, 1, 2 spines. The palpi are short, the tibia a little exceeds the patella, is inflated proximally below, and armed with two long external spines beneath and one internal. The bulb of the palpal organ is piriform, passing gradually into the spine, which is lightly curved.

Measurements in millimetres.—Total length 10; length of carapace 4·5, of first leg 15, second leg 14, third leg 13, fourth leg 18.

Genus EUAGRUS, Auss.

Euagrus caffer, sp. n.

♀.—Prevailing colour deep brown; hairy clothing silky yellowish brown; abdomen dark above and speckled with pale spots; legs with a pink dorsal rim on the distal end of the segments.

Carapace one fourth longer than wide, as long as patella + tibia of fourth leg and as patella + tibia + ½ the protarsus of the first, a little shorter than protarsus and tarsus of fourth. *Eyes* of anterior line strongly procurved, anterior edge of medians, if anything, behind the posterior edge of the laterals, close together, medians about half their diameter from each other and from the laterals, to which they are subequal in area; posterior laterals as large as anterior laterals and subequal to them. Tibia of first and second *legs* armed with spiniform setæ, with at most a pair of inferior apical spines; protarsi armed with many strong spines; tarsi scarcely spined; tarsus of palp spined; tibiæ of third and fourth furnished with spiniform setæ; protarsi strongly and numerously spined; tarsi with a few spines. Anterior *spinners* separated by a space which exceeds their width; posterior spinners 1½ times as long as carapace, second segment exceeding the first, the third a little shorter than the sum of the other two.

♂.—Smaller than female; *carapace* longer than patella + tibia of first leg and about as long as its protarsus + tarsus. *Palpus* short, scarcely surpassing patella of first leg, its tibia inflated below proximally, longer than the patella, armed on the inner side beneath with three long spiniform setæ; tarsus short, truncate, as in the Aviculariidæ; the palpal organ long, quite as long as the tibia, the bulb oval, piriform, gradually passing into the spine, which is stout and curved basally and very slender, filiform, and straight distally, with a slight apical curve. Tibia of first *leg* strongly spined internally, much thicker than the protarsus, which has 1, 2, 2 spines beneath; tibia of second leg a little inflated internally, armed near the middle of its length on the inner side with a large triangular process, which is itself armed anteriorly with three short, sharp, tooth-like spines; protarsus with a low angular spine-tipped process in the middle of its basal half beneath.

Measurements in millimetres.— ♀. Total length 14; carapace 6·5; spinners 9; first leg 13·5, second 13, third 13·5, fourth 14; patella + tibia of first or fourth 5, protarsus + tarsus of first 4·5, of fourth 5·5.

♂. Carapace 4·2; first and second leg 11, third leg 11·5.

Loc. Durban (*G. P. Staunton*).

Mr. Staunton is particularly to be congratulated on this capture which adds a new genus to the fauna of Africa. Hitherto *Euagrus* has only been known from species collected in Central America. In general form and habits *Euagrus* resembles *Ischnothele*, of which one species has been recorded from South Africa, namely, *I. mashonica*, from Mashonaland, where it was found by Mr. J. ff. Darling (Ann. & Mag. Nat. Hist. (7) vii. p. 337, 1901). *Ischnothele*, however, has the labium and maxillæ cuspulate, two rows of teeth on the mandibles, and the tibia of the first leg modified in the male.

Fam. Ctenizidæ.

Genus Stasimopus, Sim.

Stasimopus nigellus, sp. n.

♂.—*Colour* jet-black, with the tarsi and distal end of the protarsi yellowish red; paler brownish beneath, the genital plate and opercula testaceous.

Carapace coarsely rugose, as in *S. insculptus*, Poc., from King William's Town, a little longer than tibia of first leg or of palpus, equal to protarsus of fourth.

Eyes of anterior line large, subequal, and subequally spaced, less than a diameter apart, scarcely at all procurved, their anterior edges in approximately the same straight line; eyes of posterior line small, subequal, widely separated, but the median nearer the lateral than to the anterior median, its inner edge almost in a line with the middle point between the anterior and lateral eyes of the front row.

Palpi long and slender, midway in length between those of *P. palpiger* and *P. insculptus*; the tarsus extending to the middle of the protarsus of the first leg, the patella overlapping that of this appendage and a little longer than it, but only about half as long as its femur, and equal to two thirds the length of the tibia; the trochanter a little longer than that of the first leg.

Legs of first and fourth pairs subequal, third subequal to palpus.

Measurements in millimetres.—Total length 9; carapace 4; palpus 11; first leg 14·5, second 13, third 10·5, fourth 15.

Loc. Vredefort Road, in the Orange River Colony (*Capt. Barrett-Hamilton*).

Genus Moggridgea, O. P. Cambr.

Moggridgea Stauntoni, sp. n.

♀.—Easily distinguishable from the rest of the known

South-African species of this genus* by the absence of the patches of spinules on the coxæ of the first, second, and third pairs of legs, by the restriction of the spinules on the labium to the apical half of this sclerite, and of those on the coxa of the palp to three or four irregular rows on the preaxial side of the under surface. Moreover the eyes of the anterior line are either straight by their centres or slightly procurved; the medians being from about one half to three quarters of a diameter apart and from about one and a half to nearly twice their diameter from the laterals, to which they are subequal in size, being sometimes slightly larger and sometimes slightly smaller; the distance between anterior median and anterior lateral about equal to that between anterior median and posterior lateral and much greater than that between the two laterals on each side, which about equals a diameter and a half of the anterior lateral. In *M. Dyeri*, *Abrahami*, and *Whytei* the distance between the two lateral eyes is subequal to the other distances, so that the three eyes in question are disposed as if on the angles of an equilateral triangle.

The spines on the palpi and anterior two pairs of legs are inconstant in number; on the palpi there are usually two (sometimes three) spines on the inner and outer sides of the tibia and tarsus; on the first and second leg there are usually externally 8–9 tibial and 4–5 protarsal spines, while the inner side of each of these segments is usually armed with 4 spines.

Measurements in millimetres.—Total length 15; carapace 8; patella + tibia of first leg and fourth leg 7.

Loc. Durban (*G. P. Staunton*).

Genus ACANTHODON, Guér.

Acanthodon Hamiltoni, sp. n.

♀ (subadult).—*Colour* uniformly ochraceous; ocular tubercles black.

Anterior lateral *eyes* looking forwards from the extremities of a pair of large, elongate, abruptly rising tubercles, which are as long as the depression separating these tubercles from the posterior eye-cluster; the four median eyes of the latter forming a quadrangle which is only a little wider behind than it is long; the eyes compact, subequal, the anterior and posterior on each side separated by a narrow space, the anteriors separated from each other by a space of about a diameter, the posteriors by a space which a little exceeds a diameter; posterior lateral eyes very large, each larger than the sum of the adjacent eyes of the median quadrangle, their anterior edges slightly in advance of the anterior edges of the anterior medians, their centres a little in advance of the mid-point between the anterior and posterior medians, their posterior extremities a little in advance of the middle of the posterior medians; distance between posterior medians and posterior laterals about twice that between the posterior medians.

---

* For table of these see Pocock, P. Z. S. 1807, p 734.

Labium with a single row of four cusps. *Palpus* with its tibia armed externally beneath with three long spines and about eight short spines above them; tibia of first leg armed in the same place with about six long spines and twenty short spines above them; tibia of second leg with three long setiform spines beneath and only one short spine above; spines on anterior side of patella of fourth leg arranged in two or three rows, not forming a thick cluster of about half a dozen rows, as in *A. flaveolum*.

Total length 10 millim.; carapace 5.

Loc. Vredefort Road, Orange River Colony (*Capt. Barrett-Hamilton*).

Differs from the females of the other tropical and South-African species of the genus in the large size of the posterior lateral eyes and in the proximity of the posterior median eyes.

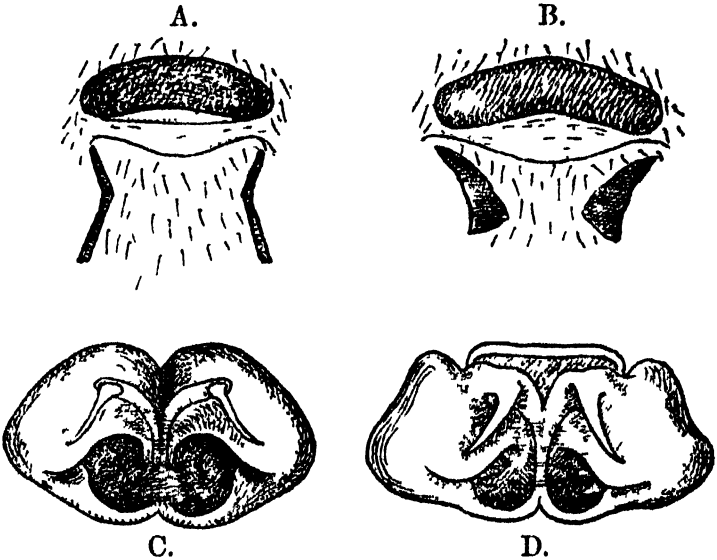
Fam. **Scytodidæ.**

Genus SCYTODES, Latr.

Scytodes Broomi, sp. n.

♀.—*Colour.* Carapace ornamented with yellow and black bands of about equal width; an anterior black patch covers the median eyes; from the anterior lateral angles of the clypeus a black stripe extends backwards on each side of the middle line, over the lateral eyes, and stops short just past the middle of the carapace in front of the highest point of the eminence; externally to this stripe arises a second of about equal width, which runs from the antero-lateral margin of the carapace towards the summit of its highest portion, then descends abruptly to its posterior border, almost or quite meeting its fellow of the opposite side; anteriorly it touches the abbreviated admedian stripe a short distance behind the lateral eyes; the external surface of the carapace may be described as covered with a black field relieved by four large pale spots, or as being ornamented with two irregular-shaped black lines united by transverse bars.

Legs yellow and black; coxæ black in front, trochanter with an anterior black spot; femora largely blackish in front, with a subapical black band and a more or less defined submedian band; distal end of patella and proximal end of tibia black, a subapical black ring as well as an indistinct median band; mandibles with black patch in front; palpi with femoral and tibial ring; labium with three black spots; sternum with four black patches on each side and a median black stripe; abdomen ornamented above with four rows of black spots; blackish beneath.



A. *Scytodes Broomi*, sp. n. Ventral abdominal sclerites of female.
B. *Scytodes Marshalli*, sp. n. Ventral abdominal sclerites of female.
C. *Cærostris corticosa*, sp. n. Vulva.
D. *Cærostris Darlingi*, sp. n. Vulva.

Carapace high, beset with short bristles rising from pores with elevated rims, which impart a sparsely granular appearance to the integument; clypeus lightly emarginate, about as long as the width of the anterior eyes. *Palp* with tarsus about twice as long as tibia and longer than tibia and patella. *Legs* long and slender, carapace shorter than tibia of third.

Horny plates on lower side of *abdomen* consisting of a pair of high crests, which at first run inwards from near the angles of the genital operculum, then turn backwards and slightly outwards at an obtuse angle; the area between these crests is at least as wide as long mesially and wider than long posteriorly, where it nearly equals the width of the genital cleft. (Fig. A, p. 322.)

Measurements in millimetres.—Total length 10; carapace 5·5; length of first leg 33, third leg 21.

Loc. Garies, in Namaqualand (*Dr. R. Broom*).

Scytodes Marshalli, sp. n.

♀.—*Colour.* Fore part of carapace brownish, with two narrow black lines on each side showing through the brown, the inner passing backwards from the median eyes, the outer from the same point over the lateral eyes; posteriorly the two are more or less confluent with a broad black stripe which extends over the summit of the carapace, is broken up by three or four pale spots, and posteriorly meets its fellow of the opposite side, the two circumscribing a conspicuous cordate yellow patch on the middle of the carapace; laterally the carapace is marbled with black and yellow. On the legs the femora and tibiæ have three black bands, the proximal and submedian tibial band showing a tendency to coalesce, the patella entirely pale above, but spotted in front; sternum black, with symmetrical yellow patches; palpi with a strong and complete distal tibial stripe; abdomen marbled with black laterally and below and in the middle above its anterior and posterior extremity.

Carapace high posteriorly, hairy, and with about the same length of clypeus as in the preceding species, as long as the tibia of second leg, a little shorter than that of first, considerably longer than patella + tibia of third.

Abdomen with horny plates distinct and bordered externally by a thickened rim or crest, each of which runs obliquely inwards and backwards from near the angles of the genital cleft without any very noticeable curvature. (Fig. B, p. 322.)

Measurements in millimetres.—Total length 8; carapace 3·5; first leg 16, its tibia 4·5; tibia of second 3·8; patella + tibia of third 3; third leg 10·5.

Loc. Estcourt, Natal, 4000 feet (*G. A. K. Marshall*).

Fam. **Uloboridæ.**

Genus DINOPIS, MacLeay.

Dinopis Stauntoni, sp. n.

♀.—*Colour.* Integument uniformly blackish brown and covered with a coating of whitish-yellow hairs, which are particularly thick upon the dorsal side of the carapace and abdomen; the underside of the trunk a little darker than the upper; the underside of the posterior bifid prominence yellowish.

Carapace of the same shape apparently as in *D. bubalus*, Sim., with an angular horn over the eyes. Femur of first and second *legs* subequal, the former basally expanded and geniculate on the inner side, to fit against the side of the head. *Abdomen* elongate, with a pair of large tubercles in front of the middle and a bifid posterior extremity.

Vulva consisting of a rounded eminence, with convex anterior and straight posterior border, impressed posteriorly with a pair of obliquely diverging pits, separated by a septum, narrow in front and broad behind.

Measurements in millimetres.—Total length 25; length of carapace 8, width 5; length of abdomen 18, width 5; second leg 43, third and fourth 22–23; femur of first 15.

Loc. Durban (*G. P. Staunton*).

This species certainly differs from *D. bubalus*, Simon, from Kilimanjaro, in the form of the vulva. This organ in *D. bubalus* is described as flat and subquadrate. Moreover, the sternum and legs are described as "luridi."

This new species may prove to be the female of *D. cylindricus*, which was also captured at Durban. If the differences pointed out between the males and females of *Dinopis* in the subjoined table prove to be merely sexual, it seems probable that the synonymy of some of the African species will work out as follows:—

D. bubo, Brit. Cap., ♂, = *D. Anchietæ*, Brit. Cap., ♀; from Angola.
D. cornigera, Gerst., ♂, = *D. bubalus*, Sim., ♀; from German East Africa.
D. cylindricus, Poc., ♂, = *D. Stauntoni*, Poc., ♀; from Natal.

Pending the settlement of this supposition the tropical African species of this genus seem to be separable by the following characters:—

a. ♀.—Carapace without white bands; abdomen with a large tubercle on each side near the middle.
  *a*¹. Femur of first leg without anterior basal enlargement (no frontal horns) . . . . *aspectans*, Poc.
  *b*¹. Femur of first leg with a large basal enlargement.

a^3. Frontal horns absent .... *ornatus*, sp. n.*
b^3 Frontal horns present .... *Anchietæ*, Brit Cap., and *bubalus*, Sim.

b. ♂.—Carapace with V-shaped cephalic stripe and pale stripe on lateral border; no median abdominal tubercles.
  a^3. Femur of first leg less than twice as long as carapace; palpus much shorter than carapace .... *cornigera*, Gerst.
  b^3. Femur of first leg about three times as long as carapace; palpus longer than carapace.
    a^4. Carapace as long as femur of palp ...... *bubo*, Brit. Cap.
    b^4. Carapace as long as femur, patella, and tibia of palp .... *cylindricus*, Poc.

Genus MENNEUS, Sim.

Menneus camelus, sp. n.

♀.—*Colour.* Integument yellow, clothed with white hairs; carapace speckled with brown laterally; abdomen variegated with olive-brown stripes and patches, somewhat as in *C. rostris*; its lower surface marked with two fuscous mesially interrupted bands; sternum infuscate laterally and behind, pale in the middle; labium infuscate distally; maxillæ with a distal fuscous patch; mandible with a fuscous patch in front and some fuscous spots; legs mostly yellow, with black spines; the tarsi and distal end of the protarsi infuscate; upperside of patella and distal end of femur of fourth leg with median black stripe.

---

* This new species may be diagnosed as follows:—

Dinopis ornatus, sp. n.

♀.—Of the same form of carapace and abdomen as *D. Stauntoni*, but without frontal horns, the superciliary ridge of the eyes being evenly rounded.

Carapace rather scantily covered mesially with short dark yellowish-brown hairs, brown forming a large triangular patch; many white hairs on the head and on the sides and posterior portion of the thoracic area; upperside of abdomen yellowish, covered with silvery white hair, with a large anterior black patch on each side and a dark patch behind the prominence, a white stripe descending on each side from the dorsal to the ventral surface in front of the prominence; lower surface with a pair of subcentral yellow patches.

Vulva convex, not strongly chitinized, furnished posteriorly with a linguiform sclerite, which is narrowed in front, but is for the most part concealed in the epigastric fold, where on each side of it the apertures of the receptacula seminis open.

Measurements in millimetres.—Total length 20; carapace 9·5; femur of first leg 19, length of fourth leg 41.

Loc. Abyssinia.

Eyes of anterior line subequal, the medians about three diameters apart and one diameter from the posterior medians, the latter twice the diameter of the anterior medians and rather more than three diameters apart and a little more than that from the posterior laterals; the median quadrangle twice as wide behind as its anterior width and about as long as its anterior width; distance between anterior lateral and anterior median eye on each side equal to three times the distance between the two medians.

Abdomen lightly expanding towards its middle, about twice as long as wide; its upper surface just behind the middle prolonged into a long conical process, which, when distended, is as long as the carapace or at least three quarters the length of the abdomen.

Vulva consisting of a simple horny triangular plate, with transverse posterior border, the apertures of the receptacula seminis on its posterior portion within the epigastric fold.

Mandibles powerful, armed with four anterior and five posterior teeth.

Measurements in millimetres.—Total length 11; carapace 5; height of abdomen 8; length of first leg 33, fourth 16.

Loc. Durban (*G. P. Staunton*).

This is the second record of the genus *Menneus* from Africa. The only other species known from this country, *M. tetragnathoides*, Simon (Bull. Soc. Zool. Fr. i. p. 218, 1876), was based upon a male from the Congo, which certainly differs from *M. camelus* in having the anterior median eyes and also the posterior median eyes about a diameter apart. The abdomen, too, is described as narrow, elongate, and parallel-sided.

Fam. **Argiopidæ.**

Genus CÆROSTRIS, Thor.

Cærostris corticosa, sp. n.

♀.—Closely resembling *C. sexcuspidata*, Fabr., in colour and general characters, but with the ventral surface of the abdomen dead black, no bitubercular prominence above the spinning-mamillæ, and the fringe on the posterior side of the femur of the fourth leg formed of slender undifferentiated hairs.

Vulva very different, the two processes long, slender, submembranous, separated by a space equalling the length of either, the area between them deeply grooved longitudinally; the two fossæ looking obliquely inwards and backwards, with a relatively small thickened sclerite lodged in the infero-external angle. (Fig. C, p. 322.)

Total length 17 millim.

Loc. Estcourt, in Natal, 4000 feet (*G. A. K. Marshall*, type); Vryburg, British Bechuanaland; Port Elizabeth (*Dr. R. Broom*); Brak Kloof, Grahamstown (*Mrs. White*); Salisbury, Mashonaland (*G. A. K. Marshall*).

I formerly (Ann. & Mag. Nat. Hist. (7) i. p. 311, 1898) referred this species to *C. Vinsonii*, Thorell, on account of the length and wide separation of the processes of the vulva. Recently, however, I have received from Mr. Quekett an example of *C. nodulosa*, Poc., from Zululand; and since the description of the vulva of *C. Vinsonii* applies more closely to this organ in *C. nodulosa* than in *C. corticosa*, I have been compelled to abandon the old supposition with regard to *C. Vinsonii*, and to give a new name to the form I at one time supposed to be that species.

Thorell's (Eug. Resa, Araneæ, pp. 4–9) contribution to our knowledge of the South-African forms of the genus *Cærostris* may be summarized as follows:—The species Simon, probably rightly, determines as *C. sexcuspidata*, Fabr., Thorell describes as *C. mitralis*, Vins., with two varieties, *humilis* and *turrigera*, based upon the form of the abdomen. As separate species he describes *C. Keyserlingii* and *C. Wahlbergii*, based also apparently upon the form of the abdomen. At all events, since the vulva is said to be alike in the three species, it is probable that they all belong to one and the same form, namely *C. sexcuspidata*. *C. Vinsonii*, on the other hand, is no doubt distinct. The vulva is described as follows:—"Vulva ut in iis [i. e. *mitralis*, *Wahlbergii*, and *Keyserlingii*] transversa, sed foveæ ejus duæ minores sunt, et antice plaga elevata, transversa, cornea, quæ impressione media, postice latiore notatur, est limitata; aculei duo recurvi, basi non uniti, in margine anteriore hujus plagæ longe ante foveas conspiciuntur."

Cærostris Darlingi, sp. n.

♀.—Nearly related to *C. sexcuspidata* and *C. corticosa*, but differing from the latter in that the fringe on the posterior side of the femur consists of expanded, flattened, blade-like hairs.

Vulva somewhat like that of *C. corticosa*, but with a distinct transverse sclerite in front of the eminence bearing the stylets; the latter much thicker at the base than in *C. corticosa* and not quite so widely separated; the two foveæ have the same aspect as in *C. corticosa*, each is occupied by an irregular membranous sclerite, and they are separated down the middle line by a strong but narrow longitudinal crest, which anteriorly bifurcates. (Fig. D, p. 322.)

Total length 20 millim.

Loc. Enkeldoorn, Mashonaland (*J. ff. Darling*).

The following table, in which a new specific character is used, may facilitate the determination of the tropical African members of this genus represented in the British Museum:—

a. Femur of fourth leg clothed behind with a brush of unmodified hairs	*corticosa*, sp. n.
b. Femur of fourth leg clothed behind with a brush of thickened, flattened, or otherwise modified hairs.	
a^1. Hairs of the brush not all alike, a few at the base of the femur much larger than the rest.	
a^2. The brush consisting of many long and relatively slender hairs, the larger basal hairs broad and spatulate	*columnifer*, nom. nov.*
b^2. The brush consisting of many very short and broad closely packed hairs, those at the base of the segment much longer and prone	*nodulosa*, Poc.†
b^1. Hairs of the brush alike or approximately alike in form, those at the base of the segment not noticeably larger than the rest.	
a^3. Hairs of the brush serially set, very broad, flat, with edge near the body convex, and slender sharpened apex ..	*albescens*, Poc.‡
b^3. Hairs of brush irregularly arranged, close-set, more numerous, and much finer.	
a^4. No basal white band on underside of tibiæ of second to fourth legs; hairs of femoral brush coarser	*femoralis*, Thor.§
b^4. A broad white band on the base of all the tibiæ; hairs of brush much finer.	
a^5. Processes on vulva short, horny, and in contact in the middle line.	*sexcuspidata*, Fabr.

---

* New name for *Cærostris turriger*, Poc. (P. Z. S. 1899, p. 857, pl. lvii. fig. 15), from the Benito River. The name "*turrigera*" was used by Thorell for one of the Caffrarian varieties of the species he described as *C. mitralis*, Vins. ('Eugenies Resa,' Araneæ, pp. 4–6).

† P. Z. S. 1898, p. 514, pl. xli. fig. 7.

‡ P. Z. S. 1899, p. 856, pl. lvii. fig. 16, from the Benito River, Congo.

§ Bih. Sv. Vet.-Akad. Handl. xxv. Afd. iv. no. 1, p. 63, from the Cameruns, Oct. 1900, = *C. argostictus*, Poc. (P. Z. S. 1899, p. 855, pl. lv. fig 5, May 1901), Benito River. The femora of this species vary in colour from red to steel-blue. M. E. Simon first drew my attention to this synonymy.

*b*¹. Processes on vulva long, slender, submembranous, and widely separated in the middle line .... *Darlingi*, sp. n.

ÆTHRISCUS, gen. nov.

Allied to *Æthrodes*, Poc. (P. Z. S. 1899, p. 861, pl. lv. fig. 2), but differing in the following characters:—

a. Ocular quadrangle slightly longer than wide, parallel-sided; carapace with a single large tubercle just in front of the fovea; upperside of abdomen with six pairs of tubercles in addition to those on the margin; seven pairs of tubercles along the anterior border, not including the lateral, and nine sigilla along the anterior border, as in *Aranæthra*; anterior lateral angles of abdomen subrectangular, the angular tubercle not larger or more prominent than the rest .... *Æthrodes*.

b. Ocular quadrangle considerably shorter than its anterior width, which much exceeds its posterior width; carapace with one small tubercle on a level with the cephalic constriction; upperside of abdomen with only marginal or submarginal tubercles; eleven sigilla along the anterior border; a very large and prominent anterior lateral tubercle, giving an acutely angular aspect to this region of the abdomen .... *Æthriscus*.

Æthriscus olivaceus, sp. n.

♀.—*Colour* olive-brown; upperside of abdomen clear olive-yellow, with darker margin.

Upperside of *abdomen* flattish, smooth and shining, with its anterior border straightish, lightly sinuous, the median emargination shallow and furnished with a pair of contiguous tubercles behind the middle third of the anterior border, similar to but less prominent and less scattered than those of *Æthrodes mammosa*, the inner being close to the median sigillum, the outer being separated from the inner by a space impressed with two sigilla; the posterior border of the upper surface bearing a pair of somewhat widely separated submedian tubercles; the anterior lateral tubercle subbifid, projecting downwards and forwards; close to the posterior border immediately behind it there is also a large erect tubercle, exceeding the others of the dorsal surface in size.

Vulva exhibiting just in front of and below the generative cleft a pair of widely separated oval apertures to the receptacula seminis; in front of these its surface rises into a triangular process, the free arch of which is produced into a slender forwardly directed scape.

Width of abdomen 15 millim.; median length 7.

Loc. Benito River, Congo (*G. L. Bates*).

Fam. **Heteropodidæ.**

Genus SELENOPS, Latr.

Selenops Stauntoni, sp. n.

♀.—Resembling *S. parvulus*, Poc., in size, coloration, and general appearance, but differing in that the tibiæ of the first and second pairs of legs are armed beneath with five pairs of spines; sometimes also there is a small apical spine on the anterior side of the tibia of the first leg. Of the eyes of the median quadrangle the posteriors are considerably larger than the anteriors, with their inferior edges only very slightly higher than the centres of the latter.

Vulva large, recalling that of *S. Spenceri*; it may be described as a longitudinally oblong horny plate, with its anterior half marked with a pallid, heart-shaped, membranous area.

Total length 7 millim.; carapace 4.

Loc. Durban (*G. P. Staunton*).

XLVII.—*Descriptions of Two new Coleoptera of the Family* Buprestidæ. By CHAS. O. WATERHOUSE, F.E.S.

Amorphosoma distans, sp. n.

Elongatum, subparallelum, crassum; capite cupreo, punctulato, in longitudinem profunde sulcato, quadrituberculato; thorace transverso, inæquali, obscure cupreo, tuberculis fusco-cupreis instructo; elytris fere nigris, area basali pube griseo-flava ornata, fascia post medium grisea; corpore subtus obscuro cupreo; metasterno abdomineque area basali albo-pubescentibus.

Long. 9 millim.

Hab. Waterberg, Transvaal, S. Africa.

The head has four round obtuse tubercles, the two on the vertex much stronger than the others. The thorax is broader than long, obscure coppery, with the raised parts much darker. The anterior part of the disk has six obtuse round tubercles (arranged thus ·∷·), and at each posterior angle a comma-shaped elevation. Each side has two obtuse angles (with a slight sinuosity between them), so that the general form of the thorax is a transverse hexagon. The elytra are nearly black, with a shade of copper at the base. The basal half is clothed with greyish-white pubescence, which near the suture shows a slight golden lustre in certain lights. There is a transverse black mark close to the base of each elytron, united with a black humeral spot. A very small black spot at the side below the shoulder, and behind this a rather large, somewhat ill-defined, oblong black mark. There are numerous other small black dots. At some distance from the apex there is a moderately broad fascia of whitish pubescence, in which are several small black marks. There is an interrupted ring of whitish pubescence close to the apex. The apex has its margin finely serrate.

This species is in the British Museum and also in Mr. W. L. Distant's collection.

Amorphosoma dentifer, sp. n.

Sat breve, crassum, cupreo-æneo tinctum; capite bituberculato; thorace lato, transverso, inæquali; elytris nigro-variegatis, hic et illic pube brevi ornatis, ante apicem fasciis duabus angulatis albis; singulo elytro ad apicem dente acuto armato et denticulato.

Long. 7 millim.

Hab. Waterberg, Transvaal, S. Africa.

Head coppery; the forehead with two slightly diverging conical tubercles, which are tipped with black scales. Thorax strongly transverse, sloping down at the sides, very convex in front, strongly impressed at the base. Obliquely widened for one third its length from the anterior angles, then subparallel (only very slightly narrowing posteriorly), and then obliquely narrowed to the base; the angles thus formed are obtuse; the margins slightly crenulate. On the disk there are four slight elevations, but they are not well defined, and on each side a distinct coppery tubercle. There is a carina extending from the posterior angle to the anterior of the two lateral angles. There is a little silvery pubescence in the basal impression, but it is only visible in certain positions. The elytra are coppery æneous, with various vague blackish marks, the most conspicuous being a rather large mark at the base; several black dots on the suture and on the margins, alternating with silvery white dots (these, however, are not very distinct); a rather broad ill-defined fascia at some distance from the apex. Near the apex there are two zigzag lines of white pubescence, which do not reach the suture. At the apex of each elytron there is a well-marked acute tooth; the sutural angle is slightly dentiform, and at the outer angle there are four minute acute teeth. The underside of the insect is coppery, shining. The sides of the metasternum are clothed with yellowish-white pubescence. On the abdomen there is a little whitish pubescence, which has a tendency to form spots. The apical segment is transverse, truncate, with the angles rounded.

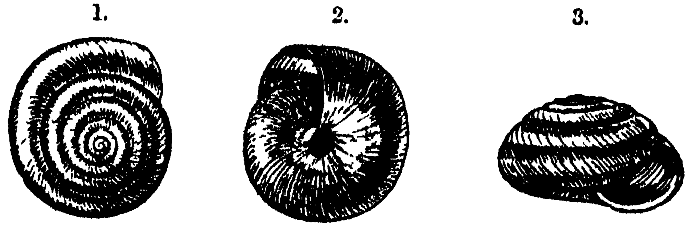
This species is in Mr. W. L. Distant's collection.

XLVIII.—*Description of Two new Helicoid Land-Shells.*

By G. K. Gude, F.Z.S.

Eulota (*Euhadra*) *Gereti*, sp. n.

Shell moderately umbilicated, depressed conoid, shining, finely and regularly ribbed, decussated by wavy impressed spiral lines; straw-yellow, with three pale chestnut bands, the upper two of which are rather narrow and well defined. The first borders the suture; the second is just above the periphery, the third below, paler than the other two and gradually fading into the paler umbilical region. Spire depressed, suture rather deep, apex obtuse. Whorls 6¼, increasing slowly and regularly, a little rounded above, somewhat flattened below, and becoming tumid towards the mouth; last whorl not descending in front. Aperture oblique, crescent-shaped; peristome straight, thin, acute, with a thickened rim inside; margins distant; columellar margin a little dilated and slightly reflected over the umbilicus, which is rather narrow but deep, showing all the whorls.



Figs. 1–3.—*Eulota* (*Euhadra*) *Gereti*, sp. n.

Diam. maj. 22·5, min. 21; alt. 15 millim.

Hab. Japan. Type in my collection.

A single specimen, labelled *Helix simodæ*, Jay, was received from Mr. P. Geret, of Paris. Upon comparison with the description and figures of the type in Pilsbry's 'Manual of Conchology,' it was at once apparent that the shell could not be referred to that species, but that it was an undescribed form, intermediate between *Eulota luna*, Pils., and *E. Editha*, A. Ad. *E. Gereti*, however, is larger than either of these two species and much more depressed than *E. luna*.

Mr. E. A. Smith kindly showed me two specimens from the Cuming Collection in the British Museum pertaining to *E. Gereti*, which were also labelled *H. simodæ*; they are, however, larger than the type, measuring 28 and 26 millim. respectively. The exact locality is not recorded in either case.

Ganesella procera, sp. n.

Shell narrowly umbilicated, trochoid, thin, solid, corneous, very finely striated, minutely granulated above and decussated with spiral lines below the periphery. Spire conical, slightly globose; suture margined, apex obtuse. Whorls 9, flattened above, a little swollen below, increasing slowly and regularly, the last not descending anteriorly, and scarcely dilated towards the mouth, with an acute pinched keel at the periphery, which is continued upwards above the suture. Aperture oblique, subquadrate; peristome thin, acute, slightly thickened, its margins distant, upper nearly straight, a little reflected, forming an angle with the basal margin, which is arcuate and well reflected; columellar margin dilated above and partly covering the narrow umbilicus.

Diam. maj. 14, min. 12·5; alt. 17 millim.

Hab. Than-moi, Tonkin. Type in my collection.

A single specimen received as *G. phonica*, Mab., from Mr. E. Boubée, of Paris, proved upon examination to be a new species. It resembles *G. eximia*, Mldff., but is larger and wider at the base, the keel is more prominent and pinched, and the umbilicus is narrower; the surface is minutely granulated above and spirally striated below, features which are lacking in *G. eximia*. *G. phonica*, *eximia*, and *procera* form a group of which *phonica* is the smallest and *procera* the largest. Mr. Ponsonby possesses a specimen similar to the type. I hope shortly to illustrate this new species, together with some others.

BIBLIOGRAPHICAL NOTICES.

International Catalogue of Scientific Literature. First Annual Issue. M. *Botany.* Published for the International Council by the Royal Society of London. London: Harrison & Sons, 45 St. Martin's Lane. Vol. I. Part 1. 1902 (May). 8vo. Pp. xiv, 378.

We have here the first specimen of the new undertaking initiated by the Royal Society, to take the place of the 'Catalogue of Scientific

Papers,' which at present is only brought down to 1883. The volume under review is due to international co-operation, each country, by its Regional Bureau, undertaking to supply the bibliography of science, to be combined into one whole by the Central Bureau in London. The idea is that of the seventeen annual volumes which are planned each should be devoted to one science, thus making it easy for specialists to subscribe for such portions as they may require.

Although printed by the month of May, the volume has only recently been issued—a delay which must be attributed to the difficulty attending every new issue of similar extent.

The scope of the volume before us may best be given by a statement of its contents. A short preface of five pages explains the foundation of the work, the contributing countries, and the list of subjects, followed by an enumeration of twenty-nine Regional Bureaus and their chiefs, explanations of the method of using the volume, and then the schedule of botanic subjects, each item having a registration number, to facilitate the grouping of titles. While each subject volume is denoted by a letter—*e. g.*, M. Botany, N. Zoology, R. Bacteriology, &c.—each item of the schedule is designated by four figures. Thus, the introductory portion comprises such items as 0040, Addresses, Lectures; 0070, Nomenclature. External Morphology and Organogeny are comprised in numbers 1000 (General) to 1800 (Teratology); similarly Anatomy, Development, and Cytology are numbered from 2000 (General) to 2900 (Cell-formation). The succeeding main headings are:—Physiology, Pathology, Evolution, Taxonomy, and Geographic Distribution. closing with an index of the subheadings. The schedule is also given in French, German, and Italian. Topographical Classification, a scheme common to all the sciences, also appears in the same languages, closing this preliminary matter. The catalogue of books and papers under the title of "Authors' Catalogue" occupies pp. 43–126. The name of the writer precedes the title of his work in usual bibliographic method, followed by the registration number or numbers under which the same paper will be found in the "Subject Catalogue;" these entries are consecutively numbered for reference. The "Subject Catalogue" of 240 pages forms the largest part of the volume; and this feature is peculiar to this series, being entirely absent in the 'Catalogue of Scientific Papers,' so far as that has been issued. Each separate item of the schedule is set out, with the particulars referring to it from the "Authors' Catalogue" repeated; the registration numbers are given at the head of each page as an indication. Under the heading Taxonomy a list of new genera and species is appended to each group—as, for instance, the Algæ, Fungi, and so forth; the running numbers of the "Authors' Catalogue" are here used to show the particular paper in which the species is published. The volume ends with an enumeration of the serials referred to, with the abbreviations employed.

The cover states that the manuscript was completed in January of the present year, from which it may be inferred that the whole of the botanic literature for 1901 is not included. This is explicitly admitted in a notice on page xiv, in which it is stated that the second part of the volume will be issued in a few months.

Practically the whole of the literature published in Great Britain and Ireland is included, but only a portion of some other countries. Germany and the United States are well represented, France less so, while Italy seems quite unrepresented. Japan, in spite of its distance from the Central Bureau, is well to the front, a sign of the energy of that enterprising nation.

It is to be hoped that this endeavour to supply promptly a review of the scientific literature of the world will be successful, and thus supply the worker with information so much needed; in that case the new venture of the Royal Society will earn the hearty thanks of every working naturalist.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by W. T. Blanford.—*Rhynchota.* Vol. I. (*Heteroptera*). By W. L. Distant. London, &c., 1902. Pp. xxxviii, 438.

This valuable series of works on the Fauna of British India continues to make steady progress, and we have now to record the appearance of a volume dealing with the first three families (Pentatomidæ, Coreidæ, and Berytidæ) of the suborder Rhynchota (or Hemiptera) Heteroptera, which comprises the true bugs. Though not one of the largest orders of insects, it includes a considerable number of handsome and interesting forms, and many of the shield-bugs (formerly placed in a distinct family, but now usually included in the Pentatomidæ) rival the most brilliant beetles in their rich metallic hues; and, indeed, many of them might easily be mistaken for beetles at a first glance but for the antennæ; and for the scutellum, which latter often overlaps and covers the wings and wing-cases, and is not divided by a suture down the middle, as are the wing-cases of beetles, which correspond in function and appearance to the scutellum of the shield-bugs.

The general scheme of the work is the same as in previous volumes.

Mr. Blanford's preface informs us of the progress of the present series of works, from which we gather that volumes on Ants by Col. C. T. Bingham, Longicorn Coleoptera by Mr. C. J. Gahan, and another on Land-Mollusca (author not stated) may be expected in the immediate future. Then follows a list of the principal works quoted in the synonymy (pp. v–xi), the Systematic Index (pp. xiii–xxii), the Introduction, the descriptive part of the work, and the Alphabetical Index.

The Introduction details the materials used in the composition of the volume, proceeds to discuss the structure, habits, classification, &c. of the Rhynchota, illustrated by a series of excellent diagrams, and concludes with a synopsis of the families of the Heteroptera.

Mr. Distant's name is a sufficient guarantee for the care and accuracy with which the systematic portion of the book has evidently been compiled; and a word of praise is due to Mr. H. Knight for the series of 249 illustrations in the text, which are among the most excellent which we have seen. They are without colour; but this deficiency is less noticeable in Rhynchota, with their simple colours and patterns, than in the case of Lepidoptera, for instance, with their strongly marked colours and complicated patterns, for the adequate representation of which coloured figures are often almost indispensable.

Palæontologia Indica. Series XV. *Himálayan Fossils.* Vol. III. Part 1. *Upper Triassic Cephalopod Faunæ of the Himálaya.* By Dr. Edmund Mojsisovics, Edlem von Mojsvar, Imp. Acad. Vienna, &c. Translated by Dr. Arthur H. Foord, F.G.S., and Mrs. A. H. Foord. Folio. 157 pages, 22 plates, and some woodcuts. Calcutta: Geol. Survey Office. London: Kegan Paul & Co. 1899.

The Introduction (pages 1–4) gives some account of the history of the collecting of these Triassic Fossils of the Himálaya and of the description of allied forms by several authors. The species referred to in the following list are described with few exceptions at pages 5–126.

	No. of Species
AMMONEA TRACHYOSTRACA.	
A. Tropitoidea.	
Halorites	5
Jovites	3
Parajuvavites	13
Juvavites.	
a. Anatomites	3
b Griesbachites	2
Isculites	2
[Woodcut, p. 41.]	
Sagenites	4
[Woodcut, p. 41.]	
Didymites	1
Tropites	5
Styrites	2
Eutomoceras	2
Thetidites	2
B. Ceratitoidea.	
I. Dinaritea.	
Ceratites.	
a. Helictites	1
b. Thisbites	1
Arpadites	
a Arpadites, s. s	3
[Woodcut, p. 58.]	
b Dittmarites	1
c. Clionites	6
d Steinmannites	5
e Dionites	1
II Heraclitea.	
Heraclites (Guembelites)	1
Tibetites.	
a. Tibetites, s. s.	4
[Woodcut, p. 78.]	
b. Anatibetites	2
c. Paratibetites	5
[Woodcut, p. 84.]	
Hauerites	1
III. Trachyceratea.	
Trachyceras.	
a. Protrachyceras	1
b. Trachyceras, s. s.	1
Sandlingites	2
Sirenites	3
AMMONEA LEIOSTRACA.	
A. Arcestoidea.	
Arcestes.	
Stenarcestes	1
[Woodcut, p. 97.]	

	No. of Species.
Arcestes, s. s.	3
Proarcestes	1
Lobites	1
Joannites	1
Cladiscites (Hypocladiscites)	1
Paracladiscites	2
B. PINACOCERATOIDEA.	
Pinacoceras	2
Bambanagites	2
Placites	3
Megaphyllites	1
Mojsvarites	1
Phylloceras	1
Ptychites	1
Hungarites	1
[Woodcut, p. 119.]	
NAUTILEA	
A. GYROCERATIDÆ	
Pleuronautilus	2
B. NAUTILIDÆ.	
Nautilus	3
Clydonautilus	3
C. ORTHOCERATIDÆ.	
Orthoceras	1
DIBRANCHIATA.	
AULACOCERATIDÆ.	
Atractites	1

In the Results (pages 126–157) the forms described are grouped in zones that correspond mainly, as characterized by the Cephalopods, with the Carnic (page 127) and the Juvarian (page 137) stages of the European Trias, as shown in the accompanying Table, and details are given of the relationship of these stages.

It has been the aim of geologists acquainted with the several faunæ found in these zones to work out the extent and limits of the seas of the Trias Period. The chief of these old marine areas is the so-called Thetys, including:—1. The Mediterranean Province (the most westerly inlet); 2. The Germanic shallow sea; 3. The Indian Province.

"The Germanic shallow sea forms a part of the Mediterranean Province, and may be regarded as an estuary, which was bordered by the extensive continent now sunk in the Atlantic Ocean. This Triassic 'Atlantis' existed probably already at the close of the Palæozoic period. It reached in the west probably as far as the present North-American continent, which, as is known, possesses extensive Triassic lacustrine deposits, of the character of the German Buntsandstein and Keuper in its eastern part; while pelagic deposits of the Trias are to be met with only on the Pacific slopes of this continent."

The Upper Triassic deposits in the Arctic-Pacific Provinces are not yet fully examined, but very interesting results are anticipated for the future. It is known that the Noric Tirolitidæ, spreading from the Mediterranean Province, penetrated to the eastern shore of the Pacific basin, and that "the poor Cephalopod fauna of the Werfen beds extended from the eastern regions of the Thetys into the small Mediterranean area."

Further migrations appear to have occurred while the Mediterranean gulf remained in open connexion with the Thetys. "The Indian regions of the Thetys were in uninterrupted communication with the Arctic regions in the Scythic as well as in the Dinaric period."

The author has elsewhere already referred to the simultaneous occurrence of types in remote regions of the sea and to the surprising fact that in both the Mediterranean and the Indian Trias a con-

Series	Stages	Substages	Zones of the Mediterranean Province
Bajuvarian	Rhætic	Rhætic	22 Zone of *Avicula contorta*
	Juvavian	Sevatic	21 Zone of *Sirenites Argonautæ*
			20 Zone of *Pinacoceras Metternichi*
		Alaunic	19 Zone of *Cyrtopleurites bicrenatus*
		Lacic	18 Zone of *Cladiscites ruber*
			17 Zone of *Sagenites Giebeli*
Tyrolese	Carnic	Tuvalic	16 Zone of *Tropites subbullatus*
		Julian	15 Zone of *Trachyceras Aonoides*
		Cordevolic	14 Zone of *Trachyceras Aon*
	Noric	Longobardic	13 Zone of *Protrachyceras Archelaus*
		Fassanic	12 Zone of *Dinarites avisianus*
			11 Zone of *Protrachyceras Curionii*
Dinaric	Anisic	Bosnian	10 Zone of *Ceratites trinodosus*
		Balatonic	9 Zone of *Ceratites binodosus*
	Hydaspic	Hydaspic	
Scythian	Jakutic	Jakutic	Zone of *Tirolites Cassianus*
	Brahmanic	Gandaric	
		Gangetic	

INDIAN PROVINCE

HIMALAYA	SALT-RANGE
Hochgebirgskalk (?)	Variegated Series
"*Sagenites* beds" (?)	
Beds with *Spiriferina Griesbachi*	
Zone of *Steinmannites undulatostriatus*	
Zone of *Clydonautilus Griesbachi*	
Tropites Limestone of Kalapani	
a *Daonella* beds *b* Beds of *Trach. tibeticum*	*Pseudharpoceras spiniger* (?
Zone of *Ptychites rugifer*	
Zone of *Sibirites Prahlada*	
Beds with *Ceratites subrobustus*	8 Zone of *Stephanites superbus* 7 Zone of *Flemingites Flemingianus* 6 Zone of *Flemingites radiatus* 5 Zone of *Ceratites normalis* 4 Zone of *Proptychites trilobatus* 3 Zone of *Proptychites Lawrencianus* 2 Zone of *Gyronites frequens*
Zone of *Otoceras Woodwardi*	

cordant order of successive faunæ can be proved to exist. "It is now shown that this phenomenon also extends to the Pacific region, and that it therefore comprises the whole vast region of the pelagic Triassic deposits known to us."

Research in the vast regions of the earth not yet opened out will probably settle the doubts as to the habitats of the original types of now scattered faunæ. "At the time of the Upper Trias remarkable changes in the distribution of continents and in the extent of the seas, especially in the region of the Pacific Ocean, must have taken place." It follows "that changes in the physical characters of the surface of the earth must have most materially influenced the distribution of the organic beings thereon."

Palæontologia Indica. Series XVI. *Baluchistán.* Vol. I. *The Jurassic Fauna.* Part 1. *The Fauna of the Kellaways of Mazár Drik.* By Fritz Noetling, Ph.D., F.G.S., &c. Folio. 22 pages, 13 plates. Calcutta: Geol. Survey Office. London: Kegan Paul & Co. 1896.

The lowest formation in the Mari Hills of Baluchistán is a massive limestone, for the most part yielding only some *Terebratulæ* and *Rhynchonellæ*, not well preserved; but a good fossil fauna was found in this rock near Mazár Drik, namely:—Brachiopoda, 2 species; Pelecypoda, 3 spp.; Gasteropoda, 1 sp.; Cephalopoda, 15 spp. Of the last there are three species of Nautiloidea and twelve of Ammonnera. The genus *Macrocephalites* predominates; and *M. polyphemus* is the most frequent species. Hence this massive limestone of Baluchistán is called the *polyphemus*-limestone by the Author, and appears to be equivalent to the Charee group of Kutch, and to be homotaxial with the Lower Kellaways Series of Europe.

Of the thirteen plates, pl. i. illustrates *Terebratula ventricosa*, Zieten, *Rhynchonella plicatella*, Sow.; also a *Lima* and a *Pholadomya*. Remains of a *Gervillea* and of a *Pleurotomaria* are also described (page 6).

Plates ii. to xiii. illustrate the following:—

Nautilus wandaensis *, *Waagen.*
—— giganteus *, *d'Orbigny.*
—— intumescens *, *Waagen.*
Harpoceras, sp
Sphæroceras bullatum, *d'Orb.*
Macrocephalites macrocephalus *,
Schlotheim, sp.
—— transiens *, *Waagen*
—— polyphemus *, *Waagen.*
Macrocephalites subcompressus *,
Waagen
—— grantanum *, *Waagen.*
—— opis *, *Waagen.*
Perisphinctes balinensis *, *Waagen*
(non *Neumayr*).
—— baluchistanensis, sp. nov.
—— recuperoi *, *Gemmellaro.*
—— aberrans *, *Waagen.*

The species marked with an asterisk "have been identified with specimens described from Kutch"

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 59. NOVEMBER 1902.

XLIX.—*Notes on the Natural History of East Finmark.* By Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., F.L.S.

I HAD spent three summer holidays in dredging-excursions in South and West Norway, and in 1890 I resolved to go to the extreme north-eastern district of Norway, in order to obtain the more arctic fauna.

East Finmark is a portion of that country which was formerly called Lapland, and commences a little to the east of the North Cape at the Porsanger Fiord. It extends thence to the Russian frontier as its eastern boundary, while to its south lies the northern frontier of Finland.

It is generally known that the extent of the Norwegian seaboard is very great, and is about 2000 miles from Christiania to the Varanger Fiord; but it is not usually realized how greatly the Norwegian coast all the way up trends eastwards, and, of course, directly east after the North Cape has been rounded: so that Vadsö on the Varanger Fiord is not only as far north as Disco in Buffin's Bay and as Icy Cape in Alaska, far within Behring Strait, but also nearly two degrees further east than Constantinople.

The following is the itinerary of my excursion:—

June 17.—Left Newcastle by steamer.
19.—Arrived at Bergen, and left by steamer for north the same evening.
25.—Arrived at Tromsö.
28.—Left Tromsö.
July 2.—Arrived at Vadsö.
10.—Crossed Varanger Fiord to Kirchenes in Sydvaranger.
28.—Returned to Vadsö.
31.—Left Vadsö.
Aug. 6.—Arrived at Svolvær in Lofoten.
11.—Left Svolvær.
18.—Home.

I dredged a little whilst waiting at Tromsö, and on the homeward journey worked for a few days at Svolvær in the Lofoten Islands.

At Tromsö I was joined by Herr J. Sparre Schneider, the friend who was to be my companion and who added so much to the interest and pleasure of my trip. Herr Schneider is the Curator of the Tromsö Museum, and his knowledge of the fauna of arctic Norway, on which he has written so many papers, is unequalled. It was indeed surprising to find at Tromsö, far within the Arctic Circle, a museum in which all departments of the arctic fauna were so fully illustrated and so admirably arranged. At my request Herr Schneider had engaged as my head dredger a young farmer who had a taste for natural history and had sometimes accompanied him in his work at Tromsö. Herr Bersvend Bjerking was a very fine fellow physically, and his invariable good humour, his energy and heartiness in his work, and his never-ceasing attention to myself remain as most pleasant reminiscences.

We left Tromsö, and Herr Schneider thought it well to carry with us in the steamer his small boat fitted for shallow-water work over the 500 (?) miles we had to go, in case there should be any difficulty about boats at our destination. We fortunately, however, had no difficulty in hiring a larger boat at Vadsö and in Sydvaranger. At the latter place our crew was certainly a curiously mixed one, consisting of one Englishman (myself), two Norwegians (Schneider and Bjerking), a Lapp, a Finn, and a Russian.

In the voyage between the North Cape and Vadsö we passed two very famous breeding-places of sea-birds—Sværholtklubben and Syltefjordklubben. The high cliffs were perfectly white with *Larus tridactylus*, and when a gun was fired from the steamer to arouse them, the clouds upon clouds of these gulls and other sea-fowl which filled the air were simply astonishing. Two islands at Vardö are also great breeding-places.

Vadsö is an excellent dredging-station, and the fauna, whether of tide-marks, of shallow depths, or of deep water in the middle of the Varanger Fiord, is most interesting. Nevertheless, we were glad to leave it. The inn was miserable, the place horrid to a degree. The cod brought in here in vast quantity are disembowelled and their heads cut off, and while the fish are hung up on lines to dry the refuse is left rotting on the ground, until it is gathered up in carts and carried to the fish guano manufactory to be boiled down. The stench from the chimney of that manufactory was unbearable. Herr Schneider suggested that we should cross the Varanger Fiord to Sydvaranger, in the hope of being able to find quarters with a landowner at whose house he had previously stayed when on an entomological expedition. This we did, and in the hospitable and commodious house of Herr H. Figenschou found ourselves in the lap of luxury for so outlandish a place. Here was every comfort and kind attention from our good host and his wife, with excellent food—though, of course, fresh meat was not to be expected every day, where it must of necessity be home-killed. "Kirchenes" with its owner's family and its guests—for there were several others besides ourselves—can never be forgotten.

Here at Sydvaranger we were within 7 miles of Russia. All fellow voyagers had been left behind, and among these had been some most interesting companions. During the short summer months many of the government officials appear to go to the furthest north to carry out their inspections. Thus, before coming to Sydvaranger we had met the Harbour Director, the Inspector of Fisheries of Norway, the Inspector of Inland Fisheries of Finland, the head of the Geological Survey, the Professor of Chemistry, Herr Svend Foyn (the great whale-hunter), and others of interest, besides English salmon-fishers, for the rivers of East Finmark are famous for their salmon.

Sydvaranger is, however, beyond the range of ordinary or almost any travellers. Ornithologists have been there; entomologists, especially my friend Herr Schneider, have done excellent work in the district; botanists have added species to the Norwegian flora and worked well there; but the only marine zoologists* who had previously collected in the fiords, as I was informed by Herr Schneider, were Nylander and Gadd, who, in 1855, gave what they had found to the Helsingfors Museum, but did not publish anything on the subject.

The sun never set while we were in East Finmark. Schneider was often entomologizing and I botanizing until near midnight.

I may here add that when dredging we always landed at some spot which had not previously been visited, to have a midday meal and to give our men an hour or an hour and a half's rest. While they were resting Herr Schneider was busy with his net after insects, and more especially Bombyces, which were very abundant and especially affected *Vicia cracca*, a very common vetch of the district, and which there grows with a luxuriance which I have not seen equalled in our own islands. While Schneider was collecting insects I was intent on the botany of the spot.

Geography and Geology.

Norway is divided into Stifts, Amts, and Fogderier. A Stift is a Diocese, and the whole of Norway north of lat. 65° 15′ N. is comprised in the Stift of Tromsö. This great Diocese contains three Amts—Nordland, Tromsö, and Finmark. Of these, Finmark is divided into five Fogderier—Altens, Hammerfest, Tana, Vardö, and Varanger. The first two of these Fogderier belong to West Finmark and the last three constitute East Finmark. East Finmark, as has been already stated, extends from the Porsanger Fiord, which is the next large fiord to the east of the North Cape, to the Russian frontier. Beyond Vardö, the most eastern point, the coast-line trends southward and then westward, forming the large Varanger Fiord, the entrance of which thus faces eastward. The northern shore of the Varanger Fiord is known as Nordvaranger, and here is situated the famous whale-fishing station Vadsö. The territory on the southern side of the Varanger Fiord is Sydvaranger. Running inland to the south from Varanger Fiord is Bog Fiord, which ultimately becomes forked, the western fork being Lang Fiord and the eastern Klosterelv Fiord. On the projecting land which forms these last-named fiords is situated Kirchenes, where we had our quarters. At the head of Klosterelv Fiord is Elvenes, at the mouth of the Pasvik River, which river throughout the greater part of its length from Lake Enara is the boundary between Norway and Russia. A mile or so above Elvenes, however, the Russian boundary crosses the Pasvik, in order to take in a very ancient and highly prized chapel of Boris Gleb, which Russia insisted on possessing. By the kind invitation of Madame Prebensen, the wife of the Amtmand (=a sort of Lord Lieutenant, but with much more extended powers), who was staying at Elvenes, I accompanied her to Boris Gleb, where we were most hospitably entertained by the Russian priest. The little old chapel, now no longer used, with the ancient vestments preserved in it, is very interesting. The inhabitants of the little village are Lapps, who belong to the old Greek Church *, and retain many curious old customs. They do not smoke; they will not eat or drink out of any vessel which has been used by those not of their peculiar faith. Formerly there were castrati among them for the Kingdom of God's sake; but this rite is no longer practised, unless secretly, since it has been forbidden by the government. The priest does not, of course, share these old superstitions and views.

---

* Except M. de Guerne, for whose expedition see observations in succeeding part of this paper.

The population of East Finmark embraces a mixture of Norwegians, Fins, and Lapps.

The Fins or Quains are as tall as Norwegians, and well-made men. They have usually little or no hair on the chin or cheeks, and but slight moustache; the hair is light or brown, less often dark, the cheek-bones usually high, and the eyes mostly of a cold blue colour.

The Lapps are short, and their average height not more perhaps than 5 feet. There are three sections of them:—

(*a*) Mountain or Nomadic Lapps. These are the purest breed. They are characterized usually by broad faces and dark hair, and are very commonly bow-legged. They live in tents, or, in winter, in temporarily constructed huts—wandering from place to place, in order to procure the reindeer-moss or other food for their herds of reindeer. Their clothes are chiefly made from the skins of those animals.

(*b*) River Lapps. These reside in the river-valleys of the extreme north. They are agriculturists, cultivating the land and having their cattle and sheep, and also feeding on the salmon in which the rivers (*e. g.*, Tana) abound. The only reindeer they have are for use in sledging.

(*c*) Sea Lapps. These reside on the coast and fish in the sea. With Sea Lapps Norwegians occasionally intermarry, but very rarely with Nomadic Lapps. When on my voyage north we stopped at Hammerfest, a Norwegian companion with whom I became acquainted on board lionized me through this most northern town in the world, showing me its reservoir, fountain, buildings, &c. It was Sunday morning. The bell was ringing for service, and the Sea Lapps were trooping to it; their dress was extremely pretty and picturesque, consisting of white flannel bound with crimson or bright blue. I was much pleased with the place, and resolved on my homeward journey to stop there for a week's dredging. The entire town, with all its warehouses and church, was built of wood. Only a week later news came to us at Vadsö that the whole town had been destroyed by fire. When the steamer touched there on my return voyage not a single house or building remained. The coal-heap by the wharf was still burning; all else was blackness and ruin. I went to where the church had stood, and there found and brought away a piece of the melted bell which I had heard summoning the Lapps to their morning service.

---

* All Lapps in Russia belong to the Greek Church; but those who live in the Swedish and Norwegian parts of what used to be called Lapland are Lutherans.

There is an affinity between the languages of the Lapps and Quains; but they differ entirely from all other European languages, the nearest perhaps being Hungarian.

Norway is, as it were, a skeleton. Denudation during the Glacial Epoch has been carried to an extreme; almost all sedimentary rocks have been swept off into the sea, and primary rocks for the most part alone remain. It is this which gives such a peculiar facies to the scenery within vision, for as we steam along the entire coast roches moutonnées everywhere meet the eye. Here and there, of course, some sedimentary rocks are still to be found. One of the most important deposits in northern Norway is on the outlying island of Ando, lat. 69°, which is at the northern extremity of Nordland. In this island there is a small Jurassic deposit characterized by such fossils as *Ammonites*, *Belemnites Blainvillei*, Desh., and *brevicornis*, Voltz, *Gryphæa dilatata*, Sow., several *Pectens*, *Lima duplicata*, Sow., *Astarte excavata*, Sow., *Scleropteridium Dahllianum*, Heer, *Pinus Nordenskiöldi*, Heer, *P. microphylla*, Heer, &c., &c. There is also here a seam of inferior coal.

Other small deposits of secondary rocks occur here and there on the islands to the north of this; but on the mainland up to Hammerfest and the North Cape we meet with igneous rocks, gneiss, granite, and serpentine. At the North Cape first appears a series of rocks of unknown horizon called the

"Gaisa" * system. It consists of two series—an upper, which is continued from the North Cape along the East Finmark coast as far as the Tana Fiord; and a lower series, commencing on the eastern side of the Tana Fiord and extending thence to Nordvaranger. The "Gaisa" system is composed of conglomerates embracing lumps of sandstone, quartz, granite, dolomite, &c. Up to the time of my visit all attempts to find embedded fossils in the fragments of these conglomerate rocks, and thus obtain a clue to their age, had been unavailing. A beautiful section of these rocks was seen from the steamer as we passed Kjolle and Ox Fiords, the strata presenting layers of very varied and lovely colouring. The geological formation at Vadsö and the northern shores of the Varanger Fiord consists of "Gaisa," with some glacial deposits here and there along the shore; but on crossing the fiord to Sydvaranger this interesting formation is left behind and the rocks are again igneous. This geological change, of course, cannot be without exhibiting effects on the flora and perhaps also on the fauna of the fiords.

The chief factor, however, which influences the fauna of East Finmark consists in the difference of climate. West Finmark, up to the North Cape and beyond it, is indebted to the influence of the Gulf Stream for a temperature all through the winter months which keeps the sea free from ice. The climatic conditions of the Varanger Fiord are, however, very different, and the smaller fiords, such as those of Sydvaranger, where my dredging was chiefly carried on, are completely frozen over from December or January to the middle of May or into June, the ice attaining a thickness of 2 to 3 feet. As a necessary consequence the fauna of the Varanger Fiord and of the other fiords of that district is of more arctic character than that round the North Cape, although in latitude the latter is somewhat more northern. In the summer months the difference of temperature is evidenced by the dense fogs which are commonly met with off the coast of East Finmark, and which are the result of contact of the warm air coming from the west with the cold currents passing westward from the Kara Sea. It was in one of these fogs, during which we had to lie to for twenty-seven hours, that while other passengers were filling great tubs with the cod which so freely took the bait, I employed my time in casting from the deck of the steamer a little hand-dredge off the mouth of Laksefjord, and thus obtained animals some of which are recorded as from that locality in the following notes.

---

* Gaisa, the name of a mountain in the Porsanger district.

MAMMALIA.

The following notes on a few of the mammals were given me in conversation by Herr J. Sparre Schneider when we were together in Finmark.

Ursus arctus, Linn. (Brown Bear.) Occurs through Norway; abundant in the valleys of Tromsö Amt, but scarce in East Finmark.

Gulo luscus, Linn. (Glutton.) Common in East Finmark, as throughout mountains of Norway.

Mustela martes, Linn. (Pine-Marten.) Occurs in West Finmark and perhaps in East.

Putorius ermineus, Linn. (Ermine.)

Canis lupus, Linn. (Wolf.) Common in East Finmark, but almost extinct in the rest of Norway. It comes in numbers on the ice in winter on the Pasvik River. Nine were killed one night by Herr Figenschou about five years before I was staying with him.

Vulpes alopex, Linn. (= *V. vulgaris*, Briss.). (Common Fox.) Common.

—— *lagopus*, Linn. (Arctic Fox.) Found throughout Norway, but most abundant in mountains of Finmark. Two hundred were killed by poison in one winter at Vadso some years ago.

[*Felis lynx*, Linn. (Lynx.) Does not occur in East Finmark. It has been killed in West Finmark, and is most abundant in the neighbourhood of Trondhjem, coming into the outskirts of the town in the winter months.]

Trichechus rosmarus, Linn. (Walrus.) Has been seen rarely in Finmark.

Halichœrus grypus, Fabr. (Grey Seal.) Breeds at Trondhjem, but does not now reach East Finmark, although bones of it have been found there.

Erignathus barbatus, Fabr. (Great Seal.)

Phoca vitulina, Linn. (Common Seal.)

—— *fœtida*, Fabr., = *P. annellata*, Schinz, = *P. hispida*, Schreb. (Marbled Seal.)

Pagophilus grœnlandicus, Fabr. (Greenland Seal.)

Lemmus norvegicus, Desm. (Lemming.)

Evotomys ruficanus, Sund.

Microtus ratticeps, Keys. & Blas. No rat or house-mouse occurs in East Finmark.

Alces machlis, Gray. The Elk is now altogether absent from, or, if present, very rare in, East Finmark, nor is it found on the west coast of Norway. It is still abundant about Namsos and a little further north.

Rangifer tarandus, Desm. All the Reindeer in East Finmark are now tame. They are still wild in the Hardanger district and in the central range of mountains.

Megaptera boops, Linn. Not so common as the two following.

Balænoptera musculus, Linn. This and the next are the two great whales, measuring when adult 70-80 feet in length, which chiefly occur at Vadsö.

—— *Sibbaldii*, Gray.

—— *borealis*, Lesson. Sporadic at Vadsö, more common in West Finmark.

—— *rostrata*, Fabr. Smaller species; not hunted, caught in nets and often shot. Chiefly found in Bergen district, occasionally in East Finmark.

Balæna biscayensis, Gray. Extinct in East Finmark for some 200 years (?); bones found at Vadsö and Sörö.

Hyperoodon rostratus, O. F. Müll. (Bottle-nosed Whale.) Chiefly killed in Arctic seas, but occurring in ice-floes to the north of East Finmark.

Monodon monoceros, Linn. (Narwhal.) Killed once in Varanger Fiord about eighty years ago.

Delphinapterus leucas, Pallas. (White Whale.) This species, the inhabitant of the seas of Nova Zemblia, Spitsbergen, Greenland, and N.E. America, has occurred off the East Finmark coast.

Orca gladiator, Laplace. (Grampus.) Rarely killed. It swims in herds and attacks the great whales.

Globocephalus melas, Traill. Occasional; chiefly enclosed by nets in narrow fjords and then shot. As many as 2500 have been killed at Lofoten at one time.

Lagenorhynchus albirostris, Gray. Occurs throughout the whole of Norway.

The whales which are chiefly killed for oil are *Megaptera boops*, *Balænoptera Sibbaldii*, *musculus*, *borealis*, and *rostrata*. Some years ago Vadsö was the great centre of Norwegian whale-fishery; I have a note (but do not remember whence it was taken, and therefore, though I believe it to be correct, I cannot vouch for its accuracy) that in 1884 450 whales were killed, in 1885 1398, and in 1886 954. When the fishery was at its height the harbour of Vadsö was covered with floating oil, and the stench from the dead whales must have been something frightful. The fishery at Vadsö was at the time of my visit closed; but the fishery was still continued at Mehavn, Sörö, and Jan Fjord. But the whales are now scarce. I only saw one which had been killed and perhaps half a dozen alive spouting. Their great destruction has been due to the mode of slaughter invented by the well-known

Herr Svend Foyn, whom I saw as an old man, and who has since died. He hunted the whales in steamers of about 80 tons, with engines of about 30 horse-power, shooting the whales with harpoons to which were attached cartridges, which, exploding, blew holes in the whales' sides.

MOLLUSCA.

The following catalogue contains all the Mollusca which are known to occur in East Finmark. The species found by myself have a locality attached; species of which the name only is given are inserted on the authority of G. O. Sars and others; species in this and other lists which have a * prefixed were procured by me in 1890 either at Tromsö or Svolvær, Lofoten Islands, but not in East Finmark.

CEPHALOPODA.

The following seven species are recorded by G. O. Sars:—

Ommastrephes sagittatus, Lamarck.
Gonatus amœnus, Lichtenstein.
Rossia glaucopis, Lovén.
Octopus arcticus, Prosch.

PTEROPODA.

Limacina helicina, Phipps.
—— *balea*, Moller.
Clione limacina, Phipps.

GASTROPODA.

**Tornatina nitidala*, Lovén. Svolvær, Lofoten, 5 10 fathoms.
—— *pertenuis*, Gould. Vadso, in 5-25 fathoms; Klosterelv Fiord.
Cylichna alba, Brown. Very common in East Finmark.
var. *corticata*, Beck. Vadso and Sydvaranger.
—— *propinqua*, M. Sars. In shallow water at Vadso and in all the Sydvaranger fiords.
Diaphana hyalina, Turton. Vadsö and Klosterelv Fiord.
—— *globosa*, Lovén, = *hyemalis* (Gould), G. O. Sars. Bog and Klosterelv Fiords, but only a single specimen in each locality.
Scaphander punctostriatus, Mighels.
Philine finmarchica, M. Sars. Bog Fiord.
—— *quadrata*, S. Wood. Lang Fiord, very fine specimens.
*—— *scabra*, Muller. Lofoten.
—— *lima*, Brown. Vadso and Bog Fiord.

Philine fragilis, G. O. Sars.

Acanthodoris pilosa, Müll. Tide-marks, Vadsö.

Lamellidoris muricata, Müll. Tide-marks, Vadsö.

—— *bilamellata*, Linn. Vadsö Sound.

Doris obvelata, Müll. Tide-marks, Vadsö.

Issa lacera, Müll.

Dendronotus frondosus, Ascanius. Vadsö.

—— *velifer*, G. O. Sars.

Æolidia papillosa, Linn. Vadsö.

Limapontia capitata, Müller. Tide-marks, Vadsö.

Bela pyramidalis, Ström. Vadsö and fiords of Sydvaranger; also Lofoten.

var. *semiplicata*, Sars. Vadsö.

—— *Pingelii*, Beck. Harbour at Vadsö, and in a bay west side of Bog Fiord.

—— *rugulata*, Troschel. Abundant.

var. *assimilis*, G. O. Sars. Bog and Lang Fiords.

—— *nobilis*, Möll. Varanger and Sydvaranger Fiords.

—— *scalaris*, Möll. Lang Fiord, 5–15 fathoms, one large living specimen; Vadsö Harbour, one dead.

—— *exarata*, Möll.,=*mitrula*, Lovén. The most abundant *Bela* in the district.

—— *obliqua*, Möll. One living specimen in Lang Fiord, 5–15 fathoms.

—— *cancellata*, Migh.,=*elegans*, Sars. Klosterelv and Lang Fiords.

var. *declivis*, Lovén. Much more frequent than the type, Varanger and Sydvaranger Fiords.

—— *Trevelyana*, Turton. Varanger Fiord, down to 125 fathoms; fiords of Sydvaranger and also Lofoten.

—— *decussata*, Couthouy,=*viridula*, Möll. Vadsö and Bog and Lang Fiords.

var. *conoidea*, G. O. Sars.

—— *tenuicostata*, M. Sars. One only in Bog Fiord, 100–125 fathoms.

—— *harpularia*, Couthouy. Vadsö, Bog and Lang Fiords, 5–30 fathoms.

—— *Kobelti*, Verkrüzen,=*B. viridula*, G. O. Sars (non Möll.). Varanger Fiord, east of Vadsö, in 10–25 fathoms.

—— *cinerea*, Möll.

—— *bicarinata*, Couthouy.

var. *violacea*, Migh. In all the fiords and at Lofoten in 5–30 fathoms.

Bela bicarinata, var. *cylindracea*, Beck. One living in 100–120 fathoms, Bog Fiord.

—— *angulosa*, G. O. Sars.

—— *simplex*, Midd.

—— *expansa*, G. O. Sars.

**Clathurella linearis*, Montagu. Svolvær, Lofoten.

Typhlomangelia nivalis, Lovén.

Spirotropis carinata, Phil.

Teretia amœna, G. O. Sars. A living specimen, Varanger Fiord, 125–150 fathoms.

Taranis cirrata, Brugnone, = *T. Mörchi*, Malm. Klosterelv and Bog Fiords, 5–10 fathoms.

Admete viridula, Fabr. Throughout the district, and of larger size than it attains in West Norway; reaches 16 millim. in length.

var. *undato-costulata*, Verkrüzen. Vadsö and Sydvaranger, and as large as the types.

Trophon truncatus, Strom. Living between tide-marks at Vadsö, and dredged in 5–30 fathoms in all the Sydvaranger fiords examined.

—— *clathratus*, Linn. In all the fiords down to 120 fathoms.

var. *Gunneri*, Lovén. Varanger, Lang, and Bog Fiords, 15–80 fathoms.

—— *barvicensis*, Johnston. "Porsanger Fiord" (*fide* Friele).

Purpura lapillus, Linn., and var. *imbricata*, Lamk. Vadsö, of a rich purplish-brown colour.

Astyris rosacea, Gould. Lang, Klosterelv, and Bog Fiords, and at Svolvær, Lofoten, 5–50 fathoms.

Nassa incrassata, Ström. Svolvær, Lofoten. Recorded by G. O. Sars from East Finmark.

Boreofusus bernicensis, King.

Volutopsis norvegica, Chemn.

Ukko Turtoni, Bean. Vardo, fishermen's lines.

Neptunea despecta, Linn. Bog Fiord; Vardö, fishermen's lines; Svolvær, Lofoten.

Sipho gracilis, Da Costa, var. *glabra*, Verkr. Vardö, from fishermen's lines.

—— *islandicus*, Chemn. Vardö, fishermen's lines.

—— *latericeus*, Müll. Varanger Fiord, 100–125 fathoms, and Lang Fiord, 3–30 fathoms.

Siphonorbis Verkrüzeni, Kobelt.

—— *lachesis*, Mörch.

—— *tortuosus*, Reeve.

var. *turritus*, M. Sars. Vadsö.

Siphonorbis ebur, Mörch.

—— *fusiformis*, Brod.

Buccinum undatum, Linné.

var. *borealis*, nov. nom., = var. *pelagica*, G. O. Sars (but not var. *pelagica*, King). Vadsö, in shallow water. The nearest approach to the form that we have in British seas is var. *flexuosa* of Jeffreys, from Shetland, which it resembles in its elongated form and flexuose ribs; but the latter is a much more delicate and in all respects more elegant form.

var. *cœrulea*, G. O. Sars. This variety is found at low water at Vadsö; the substance of the shell is commonly of a rich vinous-purple colour, which is especially evident on the columella. Sars says of the colouring "fusco-cærulea, faucibus intense nigro-castaneis." The ribs are often almost entirely absent on the lower whorls. It passes into var. *borealis* at a few fathoms depth.

var. *Schneideri*, Verkrüzen. A beautiful pure white form which comes up very constantly on the fishermen's lines at Vardö. I have seen half-grown specimens which might pass for the rare white variety of var. *zetlandica*; but the form is much less produced than in that variety from the Shetland Haaf; the whorls are more tumid and the ribs much more developed. Occasionally pure white examples of var. *zetlandica* occur; but in the case of var. *Schneideri* the whole race is a pure white one—at least, I did not see any similar specimens of a different colour on the quay at Vardö.

Buccinum finmarchianum, Verkrüzen. This beautiful species is brought up in great numbers by the Vardö fishermen's lines; among a large number which I procured at Vardö there was a single white specimen. I have an example in my cabinet, kindly given me by Herr Schneider, which is no less than 80 millim. long; it is referable to var. *attenuata*, G. O. Sars; 60 millim. may be considered as the ordinary limit of measurement of a full-grown shell. Sars gives as measurement of the usual form 55 millim., of var. *attenuata* 58 millim., of var. *scalaris* "Long. usque ad 65 mm."

Buccinum grœnlandicum, Chemnitz. Between tide-marks, Vadsö.

var. *nuda*. I propose this name for a remarkable form of *Buccinum* to be found on the outer side of the island which shelters the harbour of Vadsö. The form is more evenly conical than *grœnlandicum*, the whorls usually being flatter and the suture less deep. In general the whorls are perfectly smooth, without any trace of ribs, riblets, or puckers; but in other cases flexuous ribs are, more or less, developed on all the whorls accompanied by spiral riblets, and the resemblance to *B. undatum* becomes so exact that such a specimen taken by itself might be ascribed by a conchologist as being without doubt a small variety of that species. The colour varies greatly: some are pure white, others rich purple, others mottled with rufous spots on a paler yellowish ground. The length of full-grown specimens is an inch and a half. I have left to the last the important character which distinguishes it so markedly from *B. grœnlandicum*: the *epidermis is perfectly smooth*, and at no age, nor on any specimen that I have seen, could a trace be found of the longitudinal epidermal pleats, crowned with backward directed setose processes, which are so characteristic of *B. grœnlandicum*. It is not *B. parvulum*, Verkruzen, it is not at all like his figures, nor has it anything to do with a specimen in my collection which came thus named from him indirectly to myself, and which agrees perfectly with his figures, and has the seta-crowned epidermal pleats of *B. grœnlandicum*. I previously, however, had the form *nuda* in my collection (*a*) from Professor G. O. Sars, and (*b*) from Verkruzen, labelled in his writing "*Buccinum* ? n. sp., Finmark occidentalis"; and also a shorter form of the same thing, with the mouth somewhat more expanded, received from Prof. Sars, "*Buccinum grœnlandicum*, var. *patula*." I am rather inclined to believe that this form is not, in the ordinary sense of the term, a variety, but that it is a hybrid between *B. undatum* and *B. grœnlandicum*. The conditions under which it occurs are curious. The island to which I have referred is only a little place. At its north-eastern corner between tide-marks *B. undatum*, var. *cœrulea*, G. O. Sars, is found accompanied by ordinary *B. grœnlandicum*. A little further round—though really close by—for perhaps a hundred yards or so, var. *nuda* occurs in the greatest profusion; and beyond this again *B. grœnlandicum* takes its place with the usual epidermis. The purple colour so prevalent in var. *nuda*, but totally absent in the normal forms, is exactly the same colour which is so marked in Sars's *B. undatum*, var. *cœrulea*.

Buccinum hydrophanum, Hancock, var. *tumidulum*, G. O. Sars. Varanger Fiord in 100–150 fathoms.

Odostomia turgida, G. O. Sars.

—— *turrita*, Hanley.

—— *unidentata*, Mont.

Liostomia eburnea, Stimpson. Vadso, in 10–25 fathoms.

Pyrgulina eximia, Jeffreys.

—— *spiralis*, Montagu.

Eulima bilineata, Alder. Entrance to Vadsö Harbour.

Scalaria grœnlandica, Moll. Vadso and Svolvær, Lofoten, 10–25 fathoms.

var. *Loveni*, G. O. Sars. One only. Lang Fiord, 15–25 fathoms.

var. *crebricostata*, G. O. Sars. One only. Varanger Fiord, 100–125 fathoms.

Scalaria obtusicostata (S. Wood), G. O. Sars.

Læocochlis granosa, Wood.

Cerethiopsis costulata, Moll. Lang Fiord, 30 fathoms; Bog Fiord, 20–30 fathoms.

Newtoniella metula, Lovén.

Turritellopsis acicula, Stimpson. Vadso and Varanger Fiord, in shallow water to 15 fathoms.

Trichotropis borealis, Brod. & Sow. Lang and Bog Fiords and also Lofoten, down to 80 fathoms.

—— *conica*, Moll.

Littorina littorea, Linn. Vadsö, Lang Fiord, &c.

—— *rudis*, Maton, var. *grœnlandica*, Möll. Extremely abundant. When found near or quite at high-water mark on rocks it is of smaller size than when living lower down, and at the same time more richly coloured. The colour is very variable: pure white; white banded with black or brick-red; grey; grey mottled with dispersed yellow spots; black; black banded with white. A form taken in Bog Fiord has the spire more elevated than usual, and corresponds to our English var. *tenebrosa*. The surface of the shell is usually smooth or sculptured only with slightly elevated spiral ridges. At Vardo, however, a large variety occurs which is girt with strong spiral ribs, and is quite indistinguishable from *Littorina sitchana*, Philippi, from Vancouver and the Behring Sea. It is figured by Sars, Moll. Reg. Arct. Norv. pl. ix. fig. 10.

*—— *obtusata*, Linn. Occurs of quite the normal British form and appearance at Svolvær, Lofoten. In East Finmark it gives place to the following very remarkable varieties:—

var. *palliata*, Say, Sars, pl. ix. fig. 9. Tromsö, Vardo, Vadso, &c.

forma *elatior*, Sars, pl. xxi. fig. 19, has the spire so much elevated that it has the shape of *L. rudis*; it occurs between tide-marks not far from low-water mark at Vardö.

forma *coarctata*, Sars, pl. xxi. fig. 20. This extraordinary shell occurs with the last at Vardo, and is indeed an extreme form of forma *elatior*, with which, and with *palliata* of ordinary form but of large size, it is found.

Lacuna pallidula, Da Costa. Tide-marks, Vadsö.

—— *divaricata*, Fabr., var. *solidula*, Lovén. Vadsö and Bog and Klosterelv Fiords.

var. *frigida*, Lovén. Klosterelv Fiord. In both these varieties the specimens have been compared with cotypes received from the late Professor Lovén.

Skenea planorbis, Fabr. Vadsö; Klosterelv Fiord and Svolvær.

Hydrobia minuta, Totten.

**Rissoa parva*, Da Costa. Svolvær. The type not from East Finmark.

var. *interrupta*, Adams. Vadsö and Svolvær.

Alvania Jan-Mayeni, Friele. Varanger Fiord, in 100–125 fathoms. New to the Norwegian fauna.

—— *Jeffreysii*, Waller.

Cingula castanea, Möll. Lang Fiord, in 5 fathoms.

—— *tumidula*, G. O. Sars.

Onoba striata, Adams, var. *saxatilis*, Möll. (=*aculeus*, Gould). Tide-marks and shallow water, Vadsö; Lang and Bog Fiords; Svolvær.

Jeffreysia globularis, Jeffr. Klosterelv and Lang Fiords, 5–15 fathoms.

Homologyra atomos, Philippi.

Velutina lævigata, Penn. Lang and Bog Fiords.

—— *lanigera*, Möll.

Morvillia undata, Brown. Lang Fiord.

Velutella flexilis, Mont.

—— *cryptospira*, Midd.

Marsenia prodita, Lovén.

—— *micromphala*, Bergh.

—— *grœnlandica*, Möll.

Onchidiopsis glacialis, M. Sars.

Natica affinis, Gmel., = *N. clausa*, Brod. & Sow. In all the East Finmark Fiords and at Lofoten.

**Lunatia Alderi*, Forbes. Svolvær.

* —— *Montagui*, Forbes. Svolvær.

—— *grœnlandica*, Beck. Lang and Bog Fiords and Svolvær, 5–120 fathoms.

—— *nana*, Möll. Vadsö, in 10–50 fathoms.

Amauropsis islandica, Gmel. Vadsö and middle of the Varanger Fiord, 10–125 fathoms.

Calliostoma occidentale, Migh. & Ad. Bog Fiord, 20–30 fathoms.

Machæroplax obscura, Couth.

var. *bella*, Verk. Varanger, Lang, Bog, and Klosterelv Fiords, in shallow water.

var. *albula*, Gould. Vadsö, in 10–25 fathoms.

—— *varicosa*, Migh. Vadsö and Bog Fiord.

**Gibbula cineraria*, Linn. Svolvær.

—— *tumida*, Mont. Svolvær; and given to me by Herr Dahl, of Vardö, as from that place.

Margarita grœnlandica, Chemn. In all the East Finmark Fiords, at Tromsö, and at Svolvær.

var. *lævior*, Jeffr. With the last.

Margarita olivacea, Brown. Varanger, Lang, and Bog Fiords.

—— *cinerea*, Couth. Throughout the district from shallow water to 125 fathoms.

—— *helicina*, Phipps. Vadsö; Lang and Bog Fiords.

Mölleria costulata, Möll. Vadsö; Lang, Bog, and Klosterelv Fiords.

Cyclostrema Petterseni, Friele. Klosterelv and Bog Fiords in shallow water.

Scissurella crispata, Flem. In all the Sydvaranger Fiords.

Puncturella noachina, Linn. Throughout the district.

Lepeta cæca, Müll. Throughout the district.

Pilidium fulvum, Müll.

Acmæa virginea, Müll. Varanger, Klosterelv, and Bog Fiords; and at Svolvær.

—— *testudinalis*, Müll. Vadsö and Sydvaranger Fiords.

—— *rubella*, Fabr.

POLYPLACOPHORA.

Tonicella marmorea, Fabr. Throughout the district, but small.

Trachydermon ruber, Lowe. Common everywhere, but small.

—— *albus*, Linn. Throughout the district.

Leptochiton arcticus, G. O. Sars. Vadsö and Lang Fiord.

Hanleyia debilis, Gray. Lang Fiord; one very fine, measuring 22 millim. when dried. It thus approaches *H. abyssorum*, M. Sars.

SCAPHOPODA.

Dentalium entalis, Linn. Vadsö; Lang and Bog Fiords.

—— *occidentale*, Stimpson. Vadsö.

Siphonodentalium vitreum, M. Sars. Varanger, Lang, and Bog Fiords, down to 125 fathoms.

PELECYPODA.

Anomia ephippium, Linn. Varanger and Klosterelv Fiords.

var. *aculeata*, Müll. Svolvær. Sars records it from East Finmark.

Pecten islandicus, Müll. Varanger and Klosterelv Fiords.

—— *tigrinus*, Müll. Lang Fiord.

—— *septemradiatus*, Müll.

—— *imbrifer*, Lovén.

—— *grœnlandicus*, Sow. Varanger and Bog Fiords, in 80–125 fathoms.

Limea Sarsi, Lovén.

Mytilus edulis, Linn. In several places.

Modiola modiolus, Linn. Lang and Klosterelv Fiords.

—— *phaseolina*, Phil. Vadso and Lang Fiord.

Modiolaria discors, Linn. Among Corallina in rock-crevices between tide-marks at the back of the island which forms the harbour of Vadso.

—— *lævigata*, Gray. Bog and Lang Fiords, in 10–30 fathoms.

—— *nigra*, Gray. In all the Fiords, but not abundant, and I saw no large specimens, 10–125 fathoms.

—— *corrugata*, Steenst. Lang Fiord, in 15 25 fathoms.

Dacrydium vitreum, Moll. Varanger, Bog, and Lang Fiords, in 30–125 fathoms.

Crenella decussata, Mont. Vadso, and all Sydvaranger Fiords, in 15 125 fathoms.

Arca glacialis, Gray. Varanger and Bog Fiords, 30–125 fathoms.

Nucula tenuis, Mont. Abundant throughout the district.

—— *delphinodonta*, Migh.

Leda minuta, Mull. Throughout the district.

—— *pernula*, Mull. Throughout the district.

Yoldia limatula, Say. A dead specimen brought up in a small dredge which I threw out from the steamer when lying in a fog off the mouth of Laksefiord.

Portlandia lucida, Lovén. Varanger and Lang Fiords, in 25–125 fathoms.

—— *intermedia*, M. Sars. Varanger, Lang, and Bog Fiords, 80–125 fathoms.

—— *lenticula*, Fabr. Varanger, Lang, and Bog Fiords, in 5–100 fathoms.

—— *frigida*, Torell. In all the fiords, in 5–125 fathoms.

Astarte compressa, Linn. (=*A. elliptica*, Brown). In all the fiords of Sydvaranger, in 5–50 fathoms.

—— *borealis*, Chemn. Lang Fiord, Tromso and Svolvær.

var. *placenta*, Morch. Klosterelv Fiord, 5 fathoms.

—— *crebricostata*, Forbes. Varanger, Lang, and Klosterelv Fiords, in 5–125 fathoms.

—— *striata*, Leach (=*compressa*, Mont., non Linn.). Vadsö; Lang and Klosterelv Fiords, in 5–25 fathoms. Species showing considerable variation. A striking feature in East Finmark is the great abundance of Nuculidæ and Astartidæ.

Turtonia minuta, Fabr. Tide-marks, Vadsö and Klosterelv Fiord.

**Montacuta bidentata*, Mont. Svolvær.

*—— *ferruginosa*, Mont. Svolvær.

—— *Maltzani*, Verk.

**Cardium echinatum*. Svolvær.

—— *elegantulum*, Beck. Varanger, Lang, and Bog Fiords, 25-125 fathoms.

—— *ciliatum*, Fabr. (= *islandicum*, Chemn.). Varanger, Lang, and Klosterelv Fiords, 5–25 fathoms.

—— *fasciatum*, Mont. In all the fiords, also at Tromso and Svolvær.

Serripes grœnlandica, Linn. In Laminarian zone throughout the district.

Cyprina islandica, Linn. Klosterelv Fiord, 2–5 fathoms. The extreme profusion in which this species occurs in the Glacial Clays of Scotland I had always supposed to be a state of things which had entirely passed away; until at Svolvær, Lofoten Islands, I found *Cyprina* living in the same extraordinary abundance. The shore there is densely strewn with the dead shells and their comminuted remains which have been cast up.

Venus gallina, Linn. Vadso.

—— *casina*, Linn. "Vardo," *fide* Lovén.

Timoclea ovata, Penn. Svolvær. Entered by Sars as found in East Finmark.

Thyasira flexuosa, Mont.

var. *Sarsii*, Phil. Vadso, Klosterelv and Bog Fiords, and at Svolvær.

var. *Gouldii*, Phil. Varanger, Lang, and Bog Fiords, 20-125 fathoms.

—— *obesa*, Verrill. Vadsö, in 10-25 fathoms.

Axinopsis orbiculata, G. O. Sars. Vadsö and all the Sydvaranger Fiords, in 2 50 fathoms.

Lucina borealis, Linn. Svolvær. Sars records it from East Finmark.

Mactra elliptica, Brown. Vadsö.

—— *subtruncata*, Da Costa. Lang Fiord. A single specimen.

**Syndosmya prismatica*, Mont. Svolvær.

Tellina balthica, Linn. Very abundant; living between tide-marks in Klosterelv and Lang Fiords. The shells are of comparatively small size, with a dull chalky-like surface. The substance of the Klosterelv shells is white, while that of almost all those from Lang Fiord is pink.

—— *calcarea*, Chemn. Vadsö; Lang and Klosterelv Fiords; also Svolvær.

*—— *fabula*, Gmel. Svolvær.

Mya arenaria, Linn. Vadso; Klosterelv Fiord; Svolvær.

—— *truncata*, Linn. One dead, Klosterelv Fiord.

Corbula gibba, Olivi.

Panopea norvegica, Spengler. Dead valves, perhaps fossil, in Klosterelv Fiord. Sars records this from West but not from East Finmark.

Saxicava rugosa, Linn. Common throughout the district.

var. *arctica*, Linn. Occasional.

Thracia truncata, Brown. Varanger and all the Sydvaranger Fiords, 3-30 fathoms.

Cuspidaria arctica, M. Sars. This very large and fine species was found in the Varanger and Bog Fiords in 80-125 fathoms, but very rare.

—— *glacialis*, G. O. Sars. Varanger Fiord; rare in 100-125 fathoms.

—— *subtorta*, G. O. Sars. Varanger, Lang, and Bog Fiords, in 3-30 fathoms.

—— *obesa*, Lovén.

Poromya granulata, Nyst and West. "Porsanger Fiord," *fide* Friele.

BRACHIOPODA.

Terebratulina caput-serpentis, Linn., var. *septentrionalis*, Couth. Lang and Bog Fiords, in 5-100 fathoms.

Eudesia cranium, Müll. Lang Fiord, 25 fathoms. A single broken specimen.

Rhynchonella psittacea, Gmel. Varanger, Lang, and Bog Fiords, in 15-30 fathoms.

Of the Mollusca found in East Finmark the following are not as yet known elsewhere:—

Philine fragilis.
Dendronotus velifer.
Bela expansa.
Siphonorbis Verkruzeni.
Scalaria obtusicostata.
Cingula tumidula.

The following are North American, and not found elsewhere on the Norwegian coast:—

Liostomia eburnea.
Thyasira obesa.
Cuspidaria arctica.

The following are Arctic species which reach East Finmark, but are not known further south on the Norwegian coast:—

Bela simplex.
Siphonorbis lachesis.
Alvania Jan-Mayeni.
Cingula castanea.
Velutella cryptospira.
Marsenia grœnlandica.
Lunatia nana.
Machæroplax varicosa.
Turritellopsis acicula.
Portlandia intermedia.
Cardium ciliatum.
Serripes grœnlandicus.
Montacuta Maltzani.
Cuspidaria glacialis.
—— *arctica.*

The following species have not been found under more arctic conditions than those existing in East Finmark:—

Typhlomangelia nivalis.
Spirotropis carinata.
Taranis cirrata.
Odostomia turgida.
—— *unidentata.*
—— *turrita.*
Pyrgu[illegible]a eximia.
—— *spiralis.*
Eulima bilineata.
Alvania Jeffreysii.
Jeffreysia globularis.
Marsenia prodita.
Gibbula tumida.
Pilidium fulvum.
Hanleyia debilis.
Pecten tigrinus.
—— *septemradiatus.*
Limea Sarsi.
Modiola phaseolina.
Venus gallina.
—— *fasciata.*
Lucina borealis.
Mactra subtruncata.
Corbula gibba.

A comparison of this list of East Finmark Mollusca with two Norwegian catalogues which I have previously published will illustrate the changes in the Molluscan Fauna as we go further north up the Norwegian coast (see Norman, "Mollusca of the Fiords near Bergen," Journal of Conchology, vol. ii. 1879, p. 8; and "A Month on the Trondhjem Fiord," Ann. & Mag. Nat. Hist. ser. 6, vol. xii. 1893, p. 341).

[To be continued.]

L.—*On a new Species of* Paramithrax *from New Zealand.*

By George M. Thomson, F.L.S.

[Plates VII. & VIII.]

In the course of a trawling-cruise round the coasts of this colony undertaken by the Marine Department numerous trials of the inshore fishing-grounds were made by Mr. Ayson, Inspector of Fisheries, in the small chartered steamer the 'Doto.' In the course of one of these trials off Cape Saunders a number of specimens of the fine new crab described in this paper were obtained at a depth of about 50 fathoms and at a distance of some 10 miles off shore. It is rather remarkable that, though trawling has been carried on for a year or two now, the same species should not, so far as I am aware, have been met with again. There are no doubt periods of seasonal migrations even of such slow-moving creatures as crabs, for on a more recent occasion, but only once, the trawl brought up a great many specimens of *Prionorhynchus Edwardsii*, a remarkably large species originally known only from the Auckland and Campbell Islands.

The genus *Paramithrax* is represented in New Zealand by four species. Of these the three formerly described species, *P. Peronii*, M.-Edw., *P. minor*, Filhol, and *P. Latreilli*, Miers, are found along the coasts of both islands from between tide-marks to a depth of 20 fathoms. They are smaller than the species described here as *P. longipes*, and differ not only in the length of their legs, but in having the external maxillipeds smooth externally, so that the various articulations can be easily made out, while in the new species these appendages are buried in a dense mass of felted hairs.

The following is a description of the species:—

Paramithrax longipes, sp. n.
(Pls. VII. & VIII.)

Carapace almost smooth. Spines of the rostrum not divergent. Branchial regions with four submarginal spines. Basal joint of external antennæ nearly square above, its inner margin bearing a ridge which ends in a blunt tubercle. External maxillipeds buried in thick hairs, except a central white knob. Carpus of chelipeds tubercled, but without ridges; fingers smooth internally.

Male.—Carapace ovoid, rather convex, with a somewhat pronounced dorsal ridge; surface covered with scattered tubercles, rising occasionally on the median line into blunt spines, destitute of hairs.

The rostrum is produced into two long acute spines, the intermediate space being filled with short hooked hairs.

The hepatic region rises into a prominent pointed tubercle at a short distance from the margin.

The four submarginal spines on the branchial region are placed at a considerable distance from each other, the last well up on the dorsal surface. A ridge with a few tubercles passes obliquely forwards across the front of the branchial region, while in the middle of the same, a little distance to each side of the median line of the carapace, there rises a prominent spinose tubercle.

The sternal plate is deeply hollowed out between the bases of the chelipeds and is transversely ridged opposite each ambulatory leg. The abdomen is 6-jointed; the first joint is very narrow, the next much wider, the rest contracting to the extremity.

The basal joint of the external antennæ is broad, nearly square above, its outer margin somewhat curved and ending in a rounded knob, while its inner margin is produced into a strong ridge standing almost at right angles to the joint and running out into a distinct spine. The flagellum reaches slightly beyond the spines of the restrum.

The *external maxillipeds* are so thickly covered with felted hairs that only the line of junction of their second and third joints is seen, and this stands out as a tumid white projection. The inner half of the second joint is produced upwards and the outer half of the third joint downwards, the whole forming a closely-locked articulation.

The *chelipeds* are shorter than the first pair of ambulatory legs; the meros bears a few spinose tubercles on the outside and one acute tooth at its widened extremity between the prominent joint tubercles; the carpus has several tubercles on the outer surface, but is not ridged; the hand is quite smooth, externally slightly concave, on the inner side produced into a broad median elevation, above which is a long blood-red patch, all the rest of the joint being white; fingers acute at their extremities, smooth internally.

The *ambulatory legs* are very long, slender, and smooth; the meros of the first pair as long as the two succeeding joints; the dactyla cylindrical, slender, rugose towards the extremities and ending in smooth yellowish-brown claws.

In *colour* the carapace and legs are whitish grey, with blood-red spots; the hands also have a characteristic blood-red patch on the upper inner side.

Female.—The body is smaller in every way, the chelipeds are very much shorter than the first pair of ambulatory feet and are very slender.

Dimensions in millimetres.

	♂.	♀.
Length of carapace	70	55
Breadth of carapace	62	40
Length of cheliped	110	48
„ hand of same	45	21
„ first ambulatory leg	100	73

When the chelipeds of the male are extended the distance between their tips is 215 millim., between the tips of the first ambulatory legs 300 millim.

EXPLANATION OF THE PLATES.

Plate VII. *Paramithrax longipes*, G. M. Thomson. ♂, front view.
Plate VIII. The same, dorsal view.

LI.—*A Contribution to the Systematics of Scorpions.*
By R. I. Pocock.

I.—Some Corrections in Nomenclature.

The genus *Ischnurus* was first published in 1837 in 'Uebersicht des Arachnidensyst.,' pt. 1, p. 37, and based upon the species described as *I. complanatus*, the only species cited under it. *I. complanatus*, therefore, is the type of *Ischnurus*; and since *complanatus* is congeneric with the type species of *Hormurus*, that genus falls as a synonym of *Ischnurus*.

In his monograph on Scorpions (Das Tierr., Scorpiones, p. 153, 1899) Kraepelin falls into the error of dating *Ischnurus* from 1838, when Koch described under it three species—namely, *I. ochropus*, *I. australasiæ*, and *I. complanatus*; and since Thorell had eliminated the last two under *Hormurus*, Kraepelin assigned the remaining species *ochropus* to *Ischnurus*. This method of dealing was based upon the mistake in the date of publication of *Ischnurus*. The latter must take *complanatus* and *australasiæ*, leaving *ochropus* available for the name *Chiromachus*, which I proposed for it in 1893 (Ann. & Mag. Nat. Hist. (6) xii. p. 320).

These conclusions may be briefly tabulated as follows:—

1. *Ischnurus*, C. L. Koch, Uebers. Arachnidensyst. i. p. 37, pl. vi. fig. 69 (1837) (type *complanatus*).

Syn. *Sisyphus*, id. ib. on pl. vi. fig. 69 (errore for *Ischnurus*).
Ischnurus (in part only), C. L. Koch, 1838.
Hormurus, Thorell, Ann. & Mag. Nat. Hist. (4) xvii. p. 14 (1876) (type *H. caudicula*, L. Koch).
Not syn. *Ischnurus*, Thorell, Karsch, Pocock, and Kraepelin.

2. *Chiromachus*, Pocock, Ann. & Mag. Nat. Hist. (6) xii. p. 320 (1893) (type *ochropus*, C. Koch).

Syn. *Ischnurus*, C. Koch, Die Arachn. iv. p. 69 (1838) (in part.); Kraep. Jahrb. Hamb. Wiss. Anst. xi. p. 130 (1894); id. Das Tierr., Scorp. &c. p. 153 (1899).
Not syn. *Ischnurus*, C. Koch, 1837.

The name *Centrurus*, which, since 1876, has been applied by common consent to a well-known American genus of Buthidæ, was originally projected into literature in 1828 by Hemprich and Ehrenberg as a *nomen nudum*, no species being cited as referable to it (Symb. Phys., Scorpiones, 1828; Verh. nat. Fr. Berlin, 1829, p. 350; Férussac, Bull. Sci. Nat. xviii. p. 304, 1829). It is true that Ehrenberg appears to have labelled certain specimens in the Berlin Museum with the name *Centrurus*; but this action does not establish its right to recognition. The first author to introduce the name in the orthodox and accepted fashion into systematic zoology was C. Koch, who, in 1838 (Die Arachn. iv. p. 110), assigned it to a scorpion described as *Centrurus galbineus*, which was alleged by Karsch to be based upon the young of a species belonging to a genus inhabiting the Oriental Region and afterwards named *Palamnæus* by Thorell. Gervais rightly accepted Koch's application of the name *Centrurus*. Peters, on the contrary, finding Ehrenberg's labelled specimens, used *Centrurus* for the species exemplified by them, discarding *Isometrus* as a synonym, in spite of its far greater claims for admittance. If C. Koch had not previously taken up the name *Centrurus*, Peters's application of it might have been accepted, and strong reasons could have been advanced for following Thorell when, in 1876, he used *Centrurus* in a restricted sense for the genus diagnosed by himself and typified by *Scorpio gracilis* of Latr. (=*biaculeatus*, Luc.). But since the name had no recognized status until Koch introduced it, I see no escape from the conclusion that it must date from 1838 and be regarded as assignable to the genus typified by the species described by Koch as *Centrurus galbineus*.

For the genus *Centrurus*, as diagnosed by Thorell, I adopt the name *Centruroides*, which, although without a diagnosis, was given by Marx to one of the species, namely *C. exilicauda*, Wood. This species, therefore, is the type of the genus in question. It has not been described since 1863, and its generic position was unknown to Kraepelin when preparing his monograph of the scorpions in the 'Tierreich,' in spite of Marx's publication on the subject.

Its characters and synonymy are given below (see p. 376).

II.—Notes on some Species of *Parabuthus* contained in the British Museum.

1. *Parabuthus planicauda*, Poc. (Ann. & Mag. Nat. Hist. (6) iii. p. 344, pl. xv. fig. 5, 1889).—The type of *P. planicauda*, Poc. (*i. e.* the female specimen measured and described in the original description), is specifically identical with the South-African form to which Purcell has recently restricted the name *capensis* of Hempr. & Ehrenb. The evidence that these two names are synonyms, however, is very far from conclusive. In fact, all the data upon which I can lay hands point rather to the opinion that Purcell has redescribed

capensis as *neglectus*. The facts that lead me to this view are briefly these :—

(1) It is, perhaps, more likely than not that the types of *capensis* in the Berlin Museum came from German rather than from British territory in South Africa. *P. neglectus* inhabits German S.W. Africa, *P. planicauda* does not.

(2) Ehrenberg described at the same time as he described *capensis* a species named *granulatus*, which is known to occur in German S.W. Africa, where it exists alongside of *P. neglectus*. The idea that the types of the two were collected together at once suggests itself.

(3) In Keyserling's collection in the British Museum there are a couple of specimens (♂ ♀) ticketed "Cap b. espér." and labelled "*Prionurus capensis*, Ehrb.," which, from certain internal evidence, I have reasons to believe were identified by Dr. Karsch, who had access to Ehrenberg's types for comparison. These specimens are referable to *P. neglectus*, not to *P. planicauda*.

(4) Kraepelin describes the male of *P. capensis* as having wide hands. This is true of *P. neglectus*, not of *P. planicauda*. Kraepelin also had access to Ehrenberg's type.

In view of these considerations it would be a mistake to cite *planicauda* as a synonym of *capensis* until the stronger claims of *neglectus* for such a fate have been further entertained.

The British Museum has specimens of this species from Port Elizabeth (*H. A. Spencer, I. L. Drège, J. M. Leslie*), Grahamstown (*Schönland*), Tea Fountain, near Grahamstown, and Jansenville (*Miss Leppan*).

P. capensis, subsp. *Frenchi*, Purc.

The British Museum has specimens of this subspecies from Burghersdorp (*Miss Leppan*).

2. *Parabuthus neglectus*, Purcell (= *P. planicauda*, Poc., in part. Male specimen, ticketed "W. Africa," of original description).

The Museum is badly off for this species, possessing only the two males ticketed "W. Africa" that were originally referred to *planicauda*, the male and female mentioned above as belonging to Keyserling's collection, one ticketed "Cape of Good Hope" ('*Challenger*'), and one from Garies in Namaqualand (*Dr. R. Broom*).

3. *Parabuthus granulatus*, Hempr. & Ehrenb.

The British Museum has specimens from Benguela (*Monteiro*), Port Nolloth and Garies (*Dr. R. Broom*), Pearston (*Dr. Broom*), Jansenville (*Miss Leppan*), Hopefield, Graaf Reinet.

P. granulatus, subsp. *fuscus*, Poc.

Kalahari Desert (*R. Cunningham*).

The British East-African species *P. pallidus*, Poc, of which the Museum possesses examples from Mombasa, Giriama, and Taru, differs entirely from *P. granulatus* in the completion of the median lateral keel on the fourth caudal segment, the small hands of the male, the enlarged basal pectinal lobe in the female, &c.

4. *Parabuthus flavidus*, Poc. (Ann. & Mag. Nat. Hist. (7) iii. p, 419, 1899)

According to Purcell's table of the South-African species of *Parabuthus*, *P. flavidus* falls alongside *P. Schlechteri* from Bechuanaland, which is unknown to me; but the two seem to be at least separable as follows :—

a. Upper surface of second caudal segment with a moderately large oval shagreened excavation occupying its anterior half, the posterior half mesially grooved and smooth ; shagreen fine, not squamiform ; pectinal teeth in male from 46–51 .... *Schlechteri.*

b. Upper surface of second caudal segment evenly channelled throughout, the entire channel covered with coarse, mostly squamiform shagreen, pectinal teeth 36–37 in male .... *flavidus.*

The type and hitherto only recorded individual of this species is a subadult example from Taungs in Bechuanaland (*H. A. Spencer*). A much larger specimen collected by Mr. R. Cunningham in the Kalahari Desert gives the following measurements in millimetres :—

Total length 77 ; carapace 8·5 ; tail 48 ; width of first segment 6, of fourth 7 ; width of brachium 3, of hand 4·2 ; length of movable finger 7.

5. *Parabuthus cristatus*, Poc. (Ann. & Mag. Nat. Hist. (7) vii. p. 284, 1901), from the Congo, differs from *P. brevimanus* as described by Purcell in having the sides and lower surface of caudal segments 1–3 smooth, and not "densely and finely granular." Moreover, the four inferior keels of

the first are strong and smooth, not "granular" and "rather weak." The shagreened area of the first and second segments is not flanked by an oblique row of granules, giving them a broadly cuneate appearance. It is noticeable, moreover, that Purcell makes no mention of the strong lobate inferior crest running along the fore margin of the lower side of the fourth caudal segment and abutting against and as high as the U-shaped crest on the third—a feature which has no parallel in other species of the genus. Yet, since Purcell states that the description of *P. cristatus* mentions no structural character to distinguish that species from *brevimanus*, I can only conclude that the characteristic in question is present in *brevimanus*. If so, it is not a little singular that neither Thorell (who "minutely describes both sexes of *brevimanus*"), Purcell (who devotes nearly three pages to the species, mentioning all the less important details), nor Kraepelin say a word to justify the belief in its existence.

III.—Descriptions of some New and Old Species.

Family **Scorpionidæ.**

Genus Pandinus, Thorell.

Pandinus Percivali, sp. n.

♀.—*Colour* a tolerably uniform yellowish brown, the terga anteriorly darker, fingers darker; a brown spot at the distal extremity of the femur, patella, and protarsus of the leg.

Carapace densely and closely punctured; the interocular triangle and the area at the sides of and behind the median eyes smooth; some coarse punctures on the frontal lobes, and a few granules in front of the ocular tubercle; studded at the sides with coarse but not close-set granules; about as long as the first and the second and one third of the third caudal segments, and a little longer than the third and fourth segments.

Terga smooth, polished and punctured, except at the sides and along the posterior border, where, except in the middle line, there are many coarse granules; the last with the lateral crests weak, granular, the area between the admedian pair quite smooth.

Sterna quite smooth, punctulate, the last obsoletely crested.

Tail about three times as long as carapace, slender; fourth segment about twice as long as wide, third considerably less than that, fifth almost three times as long as wide; the superior and superior lateral keels denticulated; the inferior and inferior laterals smooth, except on the fourth, where they are weakly denticulated or crenate, and on the fifth, where they are distinctly denticulated; intercarinal spaces smooth; vesicle much wider than high, as wide as the third caudal segment, serially granular below and laterally.

Chelæ: humerus with superior and anterior denticulate crests, a few scattered coarse granules on the upperside; the lower side with a series, sometimes partially double, of coarse granules along the posterior border; lower side of brachium with three rows of setal pores posteriorly, the anterior crest of the lower side denticulate, the posterior smooth, the anterior surface minutely granular, with one large denticle, the posterior surface pitted with coarse punctures, but smooth; the superior crest crenate; hand very wide, its width equal to the median length of the carapace and a little shorter than the movable finger, its upperside punctulated, smooth, with a sculpturing of low smooth anastomosing ridges, nearly obsolete in the middle, but becoming coarser and more tubercular towards the inner edge and externally above the smooth keel of the underhand; inner edge of hand widely rounded, not much produced posteriorly, and strongly dentate in the middle, the denticles becoming smaller towards the base of the immovable finger and posteriorly, the whole of the posterior border of the lobe smooth; underside of the hand with a few scattered denticles and a pair of weakly denticulated keels; no large tooth on the fingers.

Legs with two external protarsal spines on the first and second, one apical on the third, and none on the fourth; tarsal lobes armed with four spines, one of which is apical, the total number of spines on the tarsi being five in front and seven or eight behind, the larger number being upon the third and fourth legs.

Pectinal teeth 21–22.

Measurements in millimetres.—Total length 98; carapace 17; tail 53; width of hand 15, length of underhand 9·8, of movable finger 16.

Loc. Al-khaur, in the Abian country, 80 miles east of Aden, in Arabia. Collected by Mr. A. B. Percival.

Apparently most nearly resembling the Somaliland species *P. meidensis* of Karsch in the sculpturing and crests on the upperside of the hand and the presence of only a small number of granules on the posterior underside of the humerus; but in *meidensis* there are four rows of setal pores on the underside of the brachium and two more spines, one on each side, upon the tarsi of the legs. The other Arabian species, *P. arabicus* of Kraepelin (Jahrb. Hamb. Wiss. Anst.

xi. p. 58, 1894; id. Das Tierr., Scorpiones &c. p. 120, 1899), described from Homran, differs from *P. Percivali* in the thick and coarse granulation of the underside of the humerus of the chela and in having only three instead of four spines on the tarsal lobes, only two keels on the upperside of the hand, &c.

Genus URODACUS, Peters.

Urodacus spinatus, sp. n.

♂.—Allied to *U. hoplurus*, Poc. (Ann. & Mag. Nat. Hist. (7) ii. p. 64, 1898), from Lawlers, Western Australia, but differing in the following features:—

The frontal portion of the *carapace* is smooth, polished, and finely punctured, not tubercular; its median area bearing the eyes is not elevated. The two granular crests on each side of the last abdominal *tergite* extend well past the middle of the plate, the external reaching further than the internal; in *U. hoplurus* the external barely reaches the middle, the internal falls far short of it.

Tail longer and thinner than in *U. hoplurus*, almost six times as long as the carapace, which is as long as its first segment + ½ of the second or as the fourth; first segment about twice as long as wide, the fourth four times as long as wide; superior keels of segments 1–4 weakly denticulated and terminating in a high, erect, triangular spike like that of *U. hoplurus*; inferior keels of the fourth distinctly but weakly denticulated; in *U. hoplurus* these keels are smooth; vesicle weakly and sparsely granular, as wide as the second caudal segment, wider than the fifth, its height about equal to the width of the fourth.

Chelæ much flatter than in *U. hoplurus*, the upperside of the brachium defined behind by a keel; the keel on the hand stronger than in *U. hoplurus*, the height of the outer surface of the hand equal to about half its length along the keel of the underhand; inferior pores on brachium and hand as in *U. hoplurus*; movable finger about as long as carapace.

Five posterior protarsal spines on first *leg*, six on second and third legs; in *U. hoplurus* there are five of these spines on the first and second legs and four on the third leg.

Pectinal teeth 20–21.

Measurements in millimetres.—Total length 93; carapace 10; tail 68; length of first segment of tail 7·5, length of fifth segment 15; width of vesicle 3·5; height of hand 5; length of underhand 8; width of hand 6·3.

Loc. Queensland: Cape York Promontory.

Urodacus subarmatus, sp. n.

♀.—*Colour* a tolerably uniform yellowish brown.

Carapace as long as the caudal segments 1+2 or 3+4, rather longer than the fifth; anteocular area smooth except for some weak tubercles behind the anterior margin, the margin obliquely truncate, with a shallow median notch; the ridges of the ocular tubercle continued in front halfway across the anteocular area, and continuous behind with the ridges bounding the posterior triangular impression.

Terga very finely granular at the sides; the internal granular keels of the last extending to the middle of the plate, the external surpassing the middle; last sternal plate with two conspicuous smooth keels.

Tail short, about four times as long as the carapace, moderately robust, first segment about as wide as long, the fifth a little more than twice as long as wide, wider than the fourth and almost as wide as the second; superior keels of segments 1–4 ending behind in a triangular spike, the anterior border, however, of which is in the same straight line as the granular superior crest; supero-lateral crest also sharply granular; inferior crests smooth, those of the fourth at most weakly granular; fifth segment with denticulated keels, its lower surface somewhat thickly granular between the keels, the median of which consists of two rows of granuliform denticulations; sides and, to a lesser extent, the upper surface of the segment granular; vesicle thickly but finely granular, as wide as the fifth caudal segment.

Chelæ with humerus weakly granular above; brachium smooth, except the crests that border its anterior surface above and below, the lower surface bordered behind by a smooth crest, in front of which there is a row of eleven pores; hand smooth all over, except for a few granules on its upper inner edge, thick, convex above, and furnished with two fairly strong finger-keels, and a row of about eleven pores beneath on the inner side of the keel of the underhand, and about twelve irregularly arranged above it; movable finger furnished throughout three fourths of its length with three closely packed rows of squamiform teeth, and in the distal fourth with a single median row, flanked on the inner side with about four short transverse rows of three teeth each and on the outer side with about four pairs of transversely set teeth.

Protarsus of first and second *legs* with six (rarely five) long, slender, subequal spines, that of the third with five, that of the fourth with four.

Pectinal teeth 17.

Measurements in millimetres.—Total length 62; carapace 9; tail 36, length of its first segment 4, of its fifth 8·6; width of hand 6·5, height 4·8; length of underhand 7·5, of finger 9·5.

Loc. Queensland: Cape York Promontory.

In many respects the type of this species resembles that of *U. armatus*, Poc., which was from Port Lincoln in South Australia. If the two had come from the same locality, I should have been inclined to regard them as sexes of one and the same species, in spite of the fact that the superior lateral keels of the first four caudal segments are smooth or nearly so in *U. armatus* and sharply granular in *U. subarmatus*. This structural character, coupled with the difference in distribution, completely justifies the view of the specific distinctness of the two forms.

Kraepelin's statements (Das Tierr., Scorpiones, p. 103, 1899), that *U. armatus* and *U. hoplurus* are characterized by the presence of a single row of teeth extending nearly throughout the length of the movable finger of the chela, that the last abdominal sternum is without conspicuous keels, and that the underside of the brachium is also keelless, have no foundation in fact.

Urodacus simplex, sp. n.

♂.—*Colour* a uniform yellowish brown.

Carapace with squarely truncate anterior border and deep median angular notch, with a small triangular sclerite in the middle; anteocular area smooth, very finely punctured, with a few granules in front; lateral portions of carapace shagreened; ocular ridges not continuous behind with the ridges bordering the posterior impression.

Terga finely and closely granular, smoother in the middle; the last with only a small number of larger granules marking the lateral keels, which are so prominent in most other species.

Tail about four times as long as the carapace, which is a little shorter than segments 1+2 or 3+4 and only a little longer than 5; sides of segments lightly convex; segments 1–4 smooth except for a few lateral granules; inferior keels smooth, superior and superior lateral keels granular or subdenticulated, the former a little elevated posteriorly; fifth segment with granular intercarinal spaces; the inferior median keel double.

Chelæ with brachium distinctly though finely granular above, smooth externally, with ten or eleven inferior setal pores; upperside of hand flat, with inner finger-keel nearly obsolete, the height of its outer side almost half its length; a row of fifteen or sixteen pores on its underside; fingers armed with a single median row of teeth and a single series of spaced teeth on each side of it, short, the movable considerably shorter than the carapace.

Legs with six protarsal spines on the first, five on the second and third.

Pectinal teeth 16.

Measurements in millimetres.—Total length 46; length of carapace 6·3, of tail 27, of first + second caudal segment 7·5, of the fifth 6·5; width of hand 4·6, height 3·2; length of underhand 5 5, of movable finger 5·5.

Loc. Queensland: Cape York Promontory.

Distinguishable from all the species known to me by the simple dentition of digits of the chelæ &c.

Family Buthidæ.

Genus Buthus, Leach.

Buthus mauritanicus, sp. n.

Colour blackish brown all over, like *B. bicolor* and *æneas*, with hand redder and tarsi pale; a pale stripe on the first, second, and third sterna.

Allied to *B. crassicauda*, Olivier, from Persia and Asiatic Turkey, but with the carapace and terga more coarsely granular and with more coarsely granular keels; the keels on the last abdominal sternum and lower side of first caudal segment smoother.

Tail keeled and with its intercarinal spaces smooth, as in *B. crassicauda*, but relatively thicker; third and fourth segments the widest of the series, the fourth as wide as long, inferior lateral keel of fifth with one large lobate tooth in front of the trilobate terminal lobe, from which it is separated by a space containing from one to three smaller teeth. In *B. crassicauda* there are about three subequal large teeth and often no distinct interval between them and the terminal lobe.

Chelæ with the hand incrassate in both sexes, that of the male large, much wider than the brachium, the movable digit only lightly sinuate, the immovable with a deep basal notch and large lobate prominence.

Pectinal teeth about 28 in both sexes.

Measurements in millimetres.—♂. Total length 69; length of carapace 8, of tail 42, width of its third segment 7, length 6·5; width of brachium 3, of hand 4; length of movable finger 9.

Loc. Morocco (adult males and females collected by Mr. F. G. Aflalo and received from the Zoological Society of London); Tangiers (*F. W. Frohawk*); Mehedija, at the mouth of the Sebu River (*E. G. B. Meade-Waldo*).

The largest example of this species I have seen is a male, measuring 75 millim., taken by Mr. Meade-Waldo.

This scorpion has probably been confounded hitherto with one or the other of the black species of *Buthus* which occur on the shores of the Mediterranean, and which have been until lately confounded as one species under the name *crassicauda*. In Journ. Linn. Soc., Zool. xxv. p. 308, I pointed out that the Egyptian black scorpion, *B. bicolor*, is quite distinct from the Persian and Syrian form, *B. crassicauda*. This opinion was adopted by Kraepelin in Das Tierr., Scorpiones, p. 17 (1899). But under the synonymy of *bicolor* appears the name *æneas*, which was given by C. Koch to an Algerian species. The British Museum, however, possesses black scorpions from Algeria and Tunisia which must be referred to *æneas*, and these I find to be specifically distinct from the Egyptian *B. bicolor*. The references and synonyms of *B. æneas* are as follows:—

Androctonus æneas, C. Koch, Die Arachn. vi. p. 3, fig. 432 (1839) (♀); id. in Wagner's Reisen in Algier, iii. p. 218, Atl. pl. x. (1841) (♀).
Androctonus bicolor, Lucas, Expl. de l'Algérie, Zool. i. p. 271, Atl. pl. xviii. (1849) (♂).

Both *B. bicolor* and *B. æneas* differ from *B. crassicauda* and *B. mauritanicus* in having the middle of the upperside of the last abdominal tergum and of the first caudal segment and to a lesser extent of the second finely and closely granular, the granular area perhaps constituting a stridulating-organ such as is found in the genus *Parabuthus* (see P. Z. S. 1892, p. 222). The Egyptian form, *B. bicolor*, may be distinguished from the Algerian *B. æneas* by having the median lateral keel strong and almost complete anteriorly upon the second and third caudal segments, and the hand in both male and female not wider than the brachium and of equal width in both sexes; whereas in *B. æneas*, to judge from the small number of specimens in the British Museum from Tunis and Algeria that I refer to this species, the hand of the adult male is longer as compared with the movable finger and thicker than the brachium, and the median lateral keel is weaker on the second caudal segment and almost absent on the third.

There is still, however, much to learn regarding the black forms of *Buthus* allied to *B. australis* and *B. bicolor*, and it may ultimately prove that *B. crassicauda* and *B. mauritanicus* are melanistic subspecies of the former.

Thorell (Bull. Soc. Ent. Ital. xxv. p. 357, 1894) has already recorded from Tunis two examples, referred to *B. australis*, which differ from the typical form only in being entirely olive-green in colour.

Genus CENTRUROIDES, Marx.

Centruroides Hasethi, sp. n.

Syn. *Centrurus granosus + Bertholdi*, Thor., Kraepelin, Das Tierr., Scorpiones et Pedipalpi, p. 90 (1899) (nec *Centrurus granosus*, Thor.; nec *C. Bertholdi*, Thor.).

In the 'Biologia Centrali-Americana,' Arachn. Scorp. pp. 27–28, I have pointed out that the male of the scorpion from Curaçoa identified by Kraepelin as *C. Bertholdi*, Thorell, which was considered to be the male of *C. granosus*, Thor., differs from *C. Bertholdi* in having no subaculear tooth upon the vesicle, the carapace longer than the first caudal segment, than half the length of the sum of the first and second, and more than one seventh the length of the tail, and in the smoothness of the upper keels of the hand; and on p. 32 I have given reasons for regarding *C. granosus* of Thorell as based upon a small specimen of *C. margaritatus*, and have pointed out that the female of the species from Curaçoa which Kraepelin referred to *C. granosus* differs from that species in colour and in having no subaculear tooth upon the vesicle.

The type (♂) of this new species and a female, both received in exchange from Dr. Kraepelin of the Hamburg Museum, were collected in the island of Curaçoa.

Their measurements in millimetres are as follows:—

♂. Total length 66; length of carapace 6; of tail 44, of its first segment 5·5, second segment 6·5, fifth segment 8; width of brachium 2, of hand 3; length of underhand 4·7, of movable finger 7.

♀. Total length 71; carapace 7; tail 48, its first segment 5, second segment 6·3, fifth 8·3.

For the sake of comparison I subjoin some of the measurements of *C. Bertholdi*, as given by Thorell:—Total length 79·5; carapace 6·5; tail 51·5, its first segment 7, second 8·5, fifth 10·3.

These dimensions speak for themselves when compared with those of the male of *C. Hasethi*.

Centruroides exilicauda (Wood).

Buthus exilicauda, Wood, Proc. Ac. Philad. 1863, p. 107; id. Journ. Ac. Philad. v. p. 368 (1863).
Centrurus exilicauda, Marx, P. Ent. Soc. Wash. p. 91 (1888).
Centruroides exilicauda, id. Proc. U.S. Mus. 1889, p. 211.

♀.—Of about the same size and coloration as *C. subgranosus*, Kr., being uniformly ochraceous with exception of the eyes, which are black; no distinct dorsal black bands, merely an indication of a slightly paler median and lateral spot on the terga; a faintly defined dark band on lower side of tail.

Upperside of *trunk* and surfaces of *tail* noticeably more coarsely and closely granular than in *C. subgranosus*; the last abdominal sternum closely granular throughout, the four keels distinctly granular and closer to each other than in that species, the fourth with traces of a pair of keels; also short lateral keels present on the terga.

Tail longer and much thinner than in *C. subgranosus*, about six times as long as carapace, as long as the third segment of the tail, the latter twice as long as wide, fifth segment about three times as long as wide; vesicle smooth, more globular, not granular, and with no subaculear tooth, only the minutest trace discernible. (In *C. subgranosus* the third caudal segment is distinctly less than twice as long as wide and the fifth is only twice and a half as long as wide; the vesicle is granular.)

Chelæ and *legs* more granular than in *C. subgranosus*, all the crests on the hand stronger and more distinctly granular, that of the underhand granular. Movable finger with stronger lobe. Coxæ of legs finely granular, especially along their anterior edges.

Pectinal teeth 19.

Measurements in millimetres.—Total length 48; carapace 4·5; tail 29, length of fifth segment 5·2, width 1·7.

Loc. Lower California: San José del Cabo (in Mus. Brit.).

The above-described specimen appears to belong to the species from Lower California named *Buthus exilicauda* by Wood, which was referred by Marx to the genus *Centrurus*, and was subsequently made by this author the type of the uncharacterized genus *Centruroides* and recorded from St. Margaret's Island. According to Wood, the species attains a length of 45 millim. (20–21 lines), has 18 pectinal teeth, very small hands, and no subaculear tooth. The colour is said to be "dilute aurantiaco-brunneus, interdum obscure maculatus," with generally an inferior stripe on the tail, apparently such as is seen in the Texan examples of *C. vittatus* in the British Museum.

The species also resembles the preceding, *C. Hasethi*, Pocock, from Curaçoa, in the absence of the subaculear tooth, but differs in having the crests on the hands studded with pearly granulation, the smaller number of pectinal teeth, the smooth and more globular vesicle, &c.

Genus Rhopalurus, Thor.

Rhopalurus Borellii, sp. n.

Heteroctenus agamemnon, Pocock, Journ. Linn. Soc., Zool. xxiv. p. 393 (1893) Nec *Tityus agamemnon*, C. Koch, Die Arachn. vi. p 103, fig. 500; and Kraepelin, Das Tierr., Scorpiones &c. p. 94 (1899) (*Centrurus*).

♀.—*Colour.* Upperside of trunk a nearly uniform yellowish brown, the frontal area of the carapace infuscate; tail yellow, with exception of the fourth and fifth segments, the latter deep blackish brown throughout, the former blackish posteriorly, more deeply and extensively so beneath and laterally than above; inferior median keels of third segment sometimes infuscate; chelæ with humerus and brachium clear yellow, hands strongly infuscate, but not so dark as the fingers, which are black, with the extreme apex yellow; mandibles distally infuscate; legs and sterna uniformly pale yellow.

Carapace coarsely granular, the granules subserially arranged laterally, as long as the first + ½ the second or as the fifth caudal segment.

Terga coarsely granular, without lateral crests.

Sterna for the most part smooth, but the depressed area on each side of the first finely and closely granular throughout as far back as the stigma, the median triangular area perfectly smooth and sparsely punctured, last sternum granular throughout and with four granular crests.

Tail thick and strong, more than five times as long as the carapace; fourth segment as wide as long, fourth and fifth a little wider than first, the former about one fourth, the latter about one third longer than wide; upperside of tail weakly granular, sides and lower surface thickly and coarsely granular, especially on the posterior segments; the keels coarsely granular, the superior subdenticulate posteriorly, upperside of fourth and fifth segments excavated, with upstanding keels; the median lateral keel strong on the second and quite distinct on the third segment, and just detectable on the fourth; vesicle weakly granular, wider than high, a little wider than the hand or the brachium; an acute subaculear tooth about twice its basal diameter from the aculeus.

Chelæ very finely granular above, with coarsely and evenly granular crests; hand narrow, as wide as brachium, its width two thirds the length of the underhand, which is less than half that of the movable finger; upper surface of hand shagreened, with feebly granular but conspicuous finger-keels; movable finger longer than fifth caudal segment, weakly lobate, with eight rows of teeth.

Legs weakly granular, with granular crests.

Pectines strongly expanded at base, as in *R. junceus*, with 19–20 teeth.

♂.—*Tail* a little longer than in female, nearly six times as long as carapace, the latter as long as the first + ¼ of the second and slightly shorter than the fifth segment, fourth segment about one fourth longer than wide.

Hand smooth, not crested, much wider than brachium, its width nearly equal to the length of the underhand, which exceeds half the length of the movable finger, the two fingers separated by a narrow ⁓-shaped space.

Pectinal teeth 24–25.

Measurements in millimetres.—♀. Total length 75; carapace 8·5; tail 44, width of first segment 5, of fourth 5·5, of brachium 2·5, of hand 2·8; length of underhand 4, of movable finger 10.

♂. Total length 77; carapace 8·5; tail 47, width of first segment 5·5, of fourth 6·5, of brachium 2·5, of hand 4·2; length of underhand 5, of movable finger 9.

Loc. Brazil (in Mus. Brit.).

I formerly supposed the specimens here described to be referable to *Tityus agamemnon* of C. Koch; but according to Kraepelin, who has presumably examined Koch's types, *T. agamemnon* has only eight keels on the second and third caudal segments, as in *junceus*. Also the median area of the first abdominal sternum is said to be granular. The species, which I have pleasure in dedicating to Dr. Borelli, is most nearly related to *R. laticauda*, Thorell.

Genus Tityus, C. Koch.

Tityus Engelkei, sp. n.

Allied to *T. pachyurus* and *T. metuendus*, but differing from both in colour as well as in certain structural characters.

Prevailing *colour* yellowish brown, frontal portion of carapace sometimes blackish anteriorly; terga never longitudinally banded and with scarcely a sign of spots; sterna not variegated; tail with its fourth and fifth segments and vesicle strongly infuscate in the adult, the upperside of the fourth paler; cheliceræ distally infuscate; legs almost uniformly pale, at most obscurely mottled distally; chelæ pale, with black fingers.

Fingers of male widely separated at base.

Pectinal teeth 21–23 in male, generally 21 in female.

Movable *finger* with 16 rows of teeth.

Measurements in millimetres.—♂. Total length 77; carapace 8; centre of tubercle to posterior border of carapace 4·5; tail 50; width of first segment 4·5, third 5·4, fourth 6; vesicle 3; length of second segment 7·5, of fourth 8·7, of fifth 8·5; width of brachium 3·3, of hand 5; length of movable finger 10 5.

♀. Total length 77; carapace 8; tail 43, width of first segment 4·3, of fifth 4·5, of brachium 3, of hand 3·5.

Loc. Onaca, 2200 feet (type), and Chiaca, 1200 feet, in St. Martha in Colombia. Collected by Mr. Charles Engelke.

Tityus Kraepelini, sp. n.

Allied to *T. magnimanus*, Poc., but with the inferior median keels of the third caudal segment not united, merely converging in the posterior third of the segment, those of the fourth confluent in the posterior half of the segment, without, however, forming a definite median longitudinal crest as in *T. magnimanus*, but a series of irregularly disposed granules.

♂.—*Colour* blackish, with the chelæ, excepting the fingers, reddish.

Tail a little longer than that of *T. magnimanus*; chelæ much like those of that species, but the fingers much shorter, the movable only as long as the fourth caudal segment, whereas in *T. magnimanus* it is longer than the fifth (9·5 : 8·6).

♀.—Differing from those of *T. magnimanus* and *trinitatis* by the structure of the inferior keels on the third and fourth caudal segments; further differing from *T. trinitatis* in the greater thickness of its tail (*cf.* measurements).

Measurements in millimetres.—♂ (type). Total length 62; carapace 6·3; tail 40, width of its fourth segment 3·5, length of third segment 7, of fourth 7·5, of brachium 7·5, of underhand 5·5, of movable finger 7·5; width of hand 3·3.

♀. Total length 62; carapace 6·5; tail 37, width of its first segment 3·6, length of the fourth 6·5, width 4, length of the fifth 7·5, width 4; length of brachium 7, width 3; length of hand 4·5, width 3·5; length of movable finger 8.

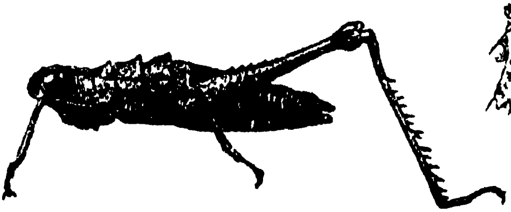
Loc. Venezuela: Merida (type) and Pedregosa.

In 1898 I received a dried female specimen of this species, ticketed "Merida," from Prof. Kraepelin. The material was, however, not sufficient to base a species upon. Recently the British Museum has acquired examples of both sexes from that locality, as well as one from Pedregosa, which satisfactorily establish the constancy of the characters.

LII.—*Description of a new Genus and Species of Apterous Locust from Ecuador.* By W. F. Kirby, F.L.S., F.E.S.

Opaon, gen. nov.

Head convex above, with a row of granulations running from the occiput nearly to the inner edge of each eye; eyes separated by a space about equal to their width; fastigium depressed, subtriangular, extending between the antennæ nearly to the length of the scape; lower part of face falling away obliquely behind the level of the eyes; antennæ with thirteen joints of the flagellum remaining, which are not unlike those of a Prionide beetle; joints very thick, two or three times as long as broad; pronotum as long as broad behind, where it is somewhat widened, transversely wrinkled, and with two distinct transverse sutures, the first about the middle, the second halfway between this and the extremity; before the middle are one or two shallow ones; hinder edge with a row of large rounded warts. Mesothorax, metathorax, and first segment of abdomen covered with larger and smaller warts, and with an irregular carina, rising into an obtuse projection behind each; the meso- and metathorax contracted in the middle, so as to leave wide interstices between, the centre of which is blackish; prosternal spine broad at base, conical and rather pointed at tip; abdomen contracted in the middle, and transversely wrinkled behind the first segment; legs rather hairy, first two pairs short, front tibiæ with no foramina, femora and tibiæ of about equal length, nearly straight, tibiæ with some short spines towards the extremity beneath; second joint of tarsi distinctly shorter than the first, third considerably longer than both the others together, smooth, widened towards the extremity; arolium* well-marked. Hind femora very long, extending for one fourth of their length beyond the abdomen, straight and rather slender, covered with large raised warts both on the carinæ, which are rather indistinctly marked, and on the surface; the two upper carinæ are close together, and the innermost is set with a row of larger blunt teeth than are visible elsewhere. Hind tibiæ as long as the femora, slightly incurved towards the base, the upper surface with seven or eight strong and nearly straight spines on each side, not symmetrical, but the outer ones placed beyond the level of the inner, almost halfway between; no terminal spine on the outer row.



Opaon granulosus, sp. n.

Long. corp. 36 millim.; long. fem. ant. 9 millim.; long. fem. post. 26 millim.

Head, antennæ, and greater part of abdomen black; palpi whitish; thorax, basal segment of abdomen, and hind legs bright red, except a black spot on the side of the first segment of the abdomen, enclosing a large yellow spiracular spot; spines of hind tibiæ black; four front legs and hind tarsi of a lighter red, with the spines and claws black.

One female specimen from Paramba, in Ecuador.

This curious insect will probably require a new family for its reception, when more specimens, representing both sexes, are obtained. In the structure and proportions of the legs &c. it shows some resemblance to *Opomala viridis*, Serv., and I therefore place it provisionally in the neighbourhood of that insect, which, however, is a winged and comparatively smooth species.

---

* This word is used by several continental entomologists for the pad between the claws which is present in many insects. It looks like a classical word, but I have been quite unable to trace its derivation from any language with which I am acquainted.

LIII.—*The Morphology of the Madreporaria.*—III. *The Significance of Budding and Fission.* By J. E. Duerden, Ph.D., A.R.C.Sc. (Lond.), Bruce Fellow, Johns Hopkins University.

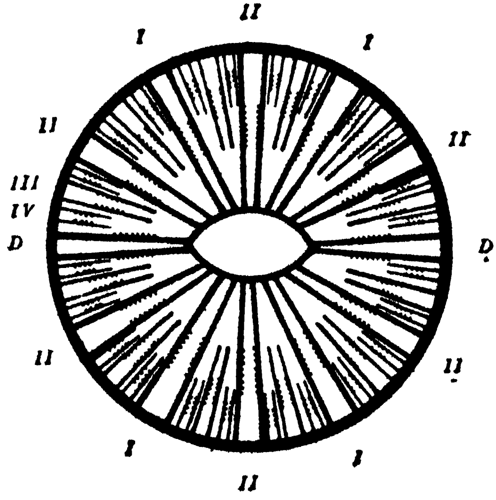
Vegetative or asexual growth is one of the most prominent characteristics of Madreporarian corals; yet, however varied in form the colonies produced thereby may become, the methods of polypal increase can apparently be reduced to two sharply defined processes—namely, budding and fission. Much has been written upon the different types of asexual reproduction in corals so far as they can be studied on the skeleton alone, and for systematic purposes an extensive terminology has arisen in connexion therewith. So far as the polyps are concerned, however, the essential morphological distinction between budding and fission has never been established. A study of a large number of West-Indian representatives of both gemmiferous and fissiparous corals reveals that the two groups are characterized by very important differences. Only the essential results and conclusions will be here presented; the full details upon which they are founded will appear in a memoir upon the general morphology of West-Indian Madreporarian polyps, shortly to be published.

The following genera of colonial corals all reproduce asexually by budding from one region or another of the polypal wall:—*Acropora* (*Madrepora*), *Porites*, *Astrangia*, *Phyllangia*, *Cladocora*, *Orbicella*, *Solenastræa*, *Stephanocœnia*, *Oculina*, and *Siderastræa*. An anatomical examination of numerous decalcified specimens of one or more species of each of the ten genera has been completed, and demonstrates that in every case the individual polyps of a colony are built upon the normal hexactinian cyclical plan. All the polyps possess at least six pairs of primary mesenteries, including two pairs of directives situated at opposite extremities.

Very different stages in mesenterial development are represented by the mature polyps of the different species. In all, with the exception of *Acropora* and *Porites*, the six pairs of primary mesenteries are united with the stomodæum and form a first cycle. In the two genera mentioned only the first four developmental pairs are complete, the fifth and sixth pairs remain permanently free from the stomodæum. Where in other genera additional mesenteries occur the next six pairs are arranged in a cycle alternating with the primary six; in some cases, as in *Phyllangia* and some species of *Orbicella*, the second order mesenteries become united with the stomodæum, but usually they are free. Where a third order of mesenteries is fully developed it consists of twelve pairs, alternating with the twelve pairs which constitute the first and second orders, and by a difference in size is recognizable as a distinct cycle. A fourth order of mesenteries would consist of twenty-four pairs, alternating with all the previous pairs, and a little shorter in radial extent, thus constituting a separate cycle.

The typical condition of a coral polyp with four complete hexameral cycles of mesenteries is diagrammatically represented in fig. 1, but such perfect regularity as is here indicated is rarely exhibited by the later cycles. Further, many polyps, even when mature, do not possess the entire number of mesenteries necessary to complete the last cycle which is begun; yet in every case the sequence, so far as it goes, is regularly cyclical and hexameral.

Fig. 1.



Diagrammatic mesenterial arrangement in a simple polyp of *Manicina areolata* in which four orders of mesenteries (I–IV) are present, arranged in three cycles. D, D, directives. Septal invaginations omitted. The section is placed with the dorso-ventral axis lateral instead of vertical, in order to facilitate comparison with figs. 2 and 3.

The septa in all the representatives of the above genera are arranged in hexameral cycles in close conformity with the mesenteries, a single septum within each entocœle and each exocœle. An order (primary, secondary, tertiary, &c.) of entosepta corresponds with each order of mesenteries, while the members of the last cycle of septa are all exosepta and correspond in number with the total number of entosepta. In *Acropora* the exosepta are frequently wanting.

The tentacles also show a close correspondence with the mesenteries and septa; a single tentacle arises from each mesenterial chamber, and corresponds with a septum below.

The results above summarized are in harmony with those of von Koch, Fowler, Bourne, and von Heider upon the morphology of other coral polyps whose asexual reproduction is by budding. There seems every reason for the assertion that wherever coral polyps arise by gemmation they conform to the hexameral cyclical plan as regards their mesenteries, septa, and tentacles; likewise two pairs of directives which denote the principal axis of the polyp are always present.

The investigations of the late Lacaze-Duthiers (1873, 1897), von Koch (1897), and H. V. Wilson (1888) have made us acquainted with the early larval development of several corals. At the beginning the organs usually arise in bilateral sequence, but in the end are found to exhibit a hexameral plan, and the six primary pairs of mesenteries include two pairs of directives. I have also followed the development of larval polyps (that is, polyps originating directly from sexually produced larvæ as compared with bud-polyps which arise asexually) of *Siderastræa radians* (Pallas) for four months, and the growth of *Favia fragum* (Esper) and *Manicina areolata* (Linn.) less completely. These are likewise characterized by cyclical hexamerism.

As gemmation usually takes place on the column wall, in close association with the mesenteries of the adult, it has not been possible to determine in many cases whether any of the organs of the adult are included in the formation of the bud, or whether the mesenterial pairs arise altogether as new formations from the polypal wall of the parent. The latter is certainly the case in buds of *Acropora*, as I have shown in the paper preceding this (1902), and the very early stage at which the polypal organs are found wholly separated in other forms would seem to imply a similar origin elsewhere.

Investigations have also been carried out upon the early development of buds, more particularly in *Acropora*, *Cladocora*, and *Solenastræa*, and as regards the order of appearance and ultimate arrangement of the organs the sequence followed is in close conformity with that of the larval polyps whose history is known.

Thus all the researches on the asexual reproduction of corals go to prove that polyps arising as buds reproduce all the characteristics of polyps formed directly from larvæ. Excepting the peculiarities dependent upon the colonial state I know of no feature by which bud polyps can be distinguished from larval polyps. The polyps arising on a colony as buds are to all intents and purposes new individuals, as much as polyps reared directly from larvæ.

Another group of West-Indian corals includes such genera as *Favia*, *Dichocœnia*, *Isophyllia*, *Manicina* *, *Mæandrina* *, *Pectinia*, and *Colpophyllia*, all of which reproduce asexually by fission, not by gemmation. The characteristics of these will now be compared with those of the gemmiferous polyps given above.

Numerous decalcified polyps or parts of the polypal system of species belonging to each genus have been studied anatomically, and beyond the early developmental stages all agree in the following features:—(*a*) absence of directive mesenteries; (*b*) absence of any hexameral or other regular cyclical plan. As such studies involve the prolonged process of decalcification and the preparation of numerous microscopic sections, it has not been found possible, except in colonies of *Manicina* and *Favia*, to investigate the entire polypal system of any large colony; but the number of typical regions examined in each species appears sufficient to warrant the summary just made.

The calcareous septa in the genera mentioned confirm the results from the mesenteries as to the absence of any hexameral cyclical regularity. While frequently three or four different sizes of septa may alternate in a manner which suggests so many different cycles, the regularity of the grouping is never continued beyond a very short distance; other septa are intercalated or some are wanting, and thus the apparent normal sequence is destroyed. Of all the species studied the corallites of ***Favia fragum*** present the nearest approach to individuality, but in scarcely any two of these is the number of septa the same, and there is no suggestion whatever of hexamerism. The septa may present an approximation to a tricyclic condition, but such is never maintained all the way round the corallite †.

---

* Verrill (1901, p. 66) has united these two genera along with *Diploria* and *Cœloria* under the genus *Mæandra* of Oken, 1815.

† Where collections of actual specimens are not available the very fine series of photographic reproductions of West-Indian corals in the recent papers of Vaughan (1901) and Verrill (1901) serve sufficiently well to show the essential differences in the characters of the septal systems of gemmiferous and fissiparous corals.

Similar results are given by Bourne (1887) for the genera *Euphyllia* and *Mussa*, and by Fowler (1888) for *Lophohelia*, all of which reproduce by fission [*]. These authors state that directive mesenteries are absent in the polyps examined by them and that the septa are only irregularly arranged in orders, and are not necessarily a multiple of six.

The special characteristics of the polypal system of fission-corals thus summarized can be fully understood only from a knowledge of the early stages of growth. For this purpose the phenomenon of polypal fission as it occurs in *Manicina areolata* and *Favia fragum* will be briefly described.

The development of the larval polyp of *Manicina* has been followed as far as the establishment of the twelve primary mesenteries, the first two cycles of tentacles, and the appearance of the six primary septa. Adherent to the dead parts of old colonies are frequently found small independent polyps, evidently derived from larvæ which had fixed themselves on the parent colony. From these all the subsequent stages of development, showing two, four, or more oral apertures, have been secured. Thus for purposes of the present study the development of *Manicina* is known from the earliest appearance of the mesenteries until fission has become fully established.

The primary tentacles, mesenteries, and septa of *Manicina* are arranged in regular hexameral cycles. The mesenteries throughout arise in a bilateral order according to a definite sequence, but in the establishment of any cycle the members become equal, as if they had arisen simultaneously. The furthest stage obtained in the growth of a simple unioral polyp is diagrammatically represented in fig. 1. Twelve pairs of mesenteries (I, II), including two pairs of directives (D, D), represent the first and second orders, and extend as far as the stomodæum; alternating with these are twelve other pairs of mesenteries, forming a second cycle and representing the third order (III); alternating with both cycles is a third cycle of twenty-four pairs (IV). The larval polyp is thus built upon the normal hexameral cyclical plan, and at this stage differs in no respects from the polyps which have been previously described as arising by gemmation.

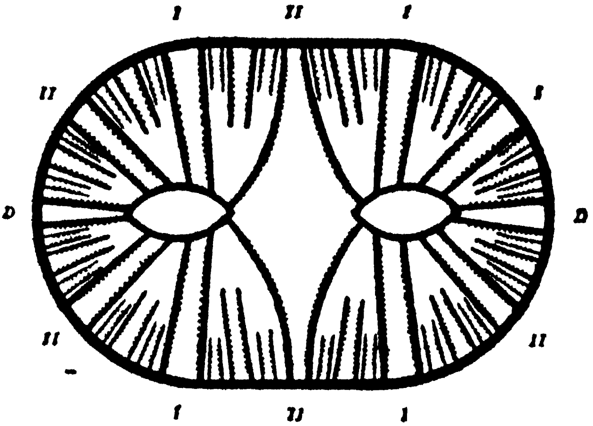
---

[*] Lacaze-Duthiers (1897, p 154) shows that in *Lophohelia proliferum* a portion of an older calice takes part in the formation of a bud (blastozoite) As here understood, this would be regarded as an instance of fission in which the two parts become almost wholly separated, and Lacaze-Duthiers apparently regarded it as such. In connexion with the differences between gemmiferous and fissiparous corals, in species where the polyps become almost wholly distinct from one another, the hexameral cyclical regularity of the septal plan in the gemmiferous *Amphihelia* and its irregularity in the fissiparous *Lophohelia*, as shown on pl viii of Lacaze-Duthiers' paper, are very instructive.

Young corallites of *Manicina* produced directly from larval polyps have been collected exhibiting the exact corresponding septal stage of fig. 1, namely, twelve large septa, twelve alternating medium septa, and twenty-four very small septa. Exosepta are usually, if not always, wanting in *Manicina*, and also in many other fissiparous corals.

It is at about the stage represented in fig. 1 that partial fission is introduced. One of the most regular instances of this obtained is shown diagrammatically in fig. 2. It is evident that a polyp at the stage of fig. 1 has become elongated in the direction of the principal or directive axis and that fission has taken place midway at right angles to this plane. Two oral apertures and two stomodæa occur, distinct from one another all the way. Attached to each stomodæum are six pairs of mesenteries, which include members of the original primary and secondary orders. Obviously only one pair of directives is available for each stomodæal system. The plane of fission is included within the shorter axis of the original oval-shaped oral aperture and within the entocœle of a pair of mesenteries on opposite sides.

Fig 2



Diagrammatic arrangement of the mesenteries in a bioral polyp of *Manicina areolata*

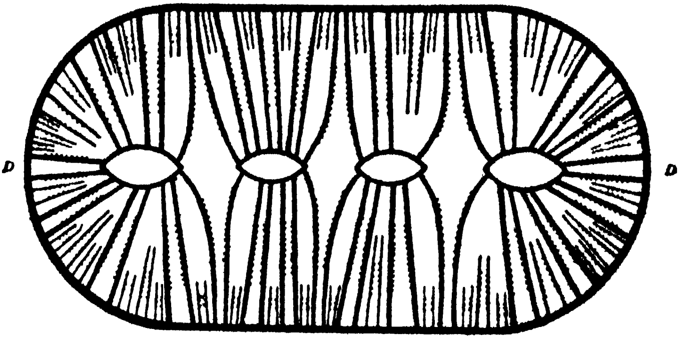
Were the two halves to become entirely distinct at this stage each would preserve the hexameral character, but would differ from the original polyp in having only one pair of directives. The third order mesenteries of fig. 1 would be second order mesenteries of the two new polyps, and the original fourth order pairs would advance to members of the third order.

Other polyps which have been examined at the bioral stage reveal that the arrangement of the mesenteries is not always so regular as that here given. Yet the essential facts are invariably the same, namely, the insertion of one pair of directives and a certain number of pairs of the original complete mesenteries on each stomodæum and the entocœlic plane of separation of the two moieties.

As the bioral polyp continues its growth more pairs of mesenteries extend as far as each stomodæum, and other new pairs arise on the polypal wall in a more or less irregular manner.

The next fission-stage available is one in which four oral apertures are present on an elongated disk surrounded by a single system of tentacles and a single column-wall. Stages with three oral apertures seem to be very rare, so that evidently fission of each of the two stomodæa occurs at about the same time. Fig. 3 represents the essential relationships of the mesenteries and the four stomodæa. By this time scarcely any constancy is evident in the number of mesenteries attached to each stomodæum or in the number of incomplete pairs which may occur in the exocœle between any two complete pairs.

Fig. 3.



Diagrammatic arrangement of the mesenteries in a polyp of *Manicina areolata* with four stomodæal systems.

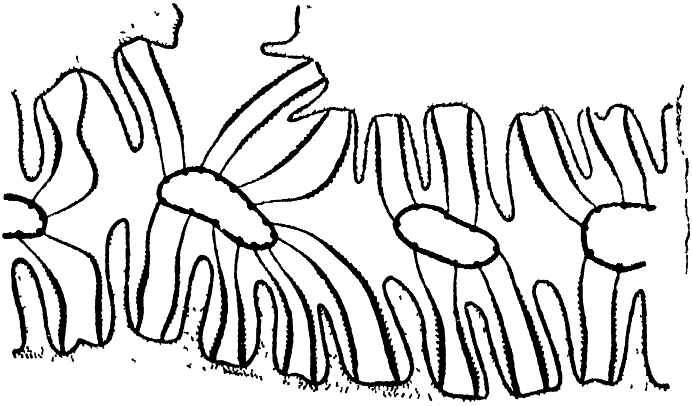
Only the two primary pairs of directives still occur, situated at the opposite extremities of the system, where growth is generally proceeding more rapidly than elsewhere. No new directives are found ever to arise. A variable number of mesenterial pairs is associated with each stomodæum, the hexameral plan being wholly departed from. Except in one doubtful case, the plane of fission has been found to be always included within the entocœle of two opposite pairs of complete mesenteries.

During the subsequent growth of the multioral polyp the original linear arrangement is soon lost, owing to the fact that one lateral area may grow more rapidly than another, and so give rise to the sinuous outlines of the mature colony. The variability in the rate of growth of different regions would seem to be the main cause of the irregularity of the cyclical plan. The smallest mesenteries become larger and ultimately reach the stomodæum, while others arise to constitute the lower orders. It is doubtful, however, as to how far mesenterial orders or cycles should be recognized in fissiparous polyps, seeing that the members of a lower order assume later the position and relationships of the higher orders. New mesenteries are intercalated among the others wherever growth is proceeding more rapidly, and this without reference to any cyclic plan. With the increase in the number of mesenteries additional stomodæa arise at somewhat regular intervals, but not, however, in such a manner as to constitute new individual polyps. Over a score of colonies of *Manicina* in various stages of growth have been sectionized; yet in no instance has more than the two primary pairs of directives occurred. Examination of parts of the mature colonies has also failed to reveal such. It must therefore be assumed that in any colony of *Manicina*, however large, only two possible pairs of directives occur, situated at what are to be regarded as the two morphological extremities of the colony.

Results similar to the above have been obtained from the early stages in the development and fission of *Favia fragum*, though examples are not so readily obtained as in the case of *Manicina*. The simple unioral polyps are found to be regularly hexameral, and in two bioral polyps studied fission had been introduced during the course of the formation of the third cycle of mesenteries. As in *Manicina*, the fission-plane in *Favia* is practically at right angles to the elongated directive plane, and is included within two entocœlic chambers belonging to opposite sides; the two pairs of directive mesenteries also remain at the opposite extremities. Likewise the number of mesenterial pairs associated with each stomodæum is variable.

Separation of the results of fission by the production of transverse partition walls takes place much more frequently in *Favia* than in *Manicina*. On any fully established colony of *Favia* many so-called polyps possess only one mouth, others two or three, but not often more. After its formation, therefore, a stomodæal system may become entirely separated from the others, provided with its own disk, zone of tentacles, and column wall, as if it were a distinct polyp. A number of these apparent polyps have been sectionized, but none show any directive mesenteries, and the hexameral plan is wholly departed from. Two or three different sizes of mesenterial pairs are represented, but the grouping does not retain the cyclical regularity all the way round. They are simply fragments cut off a larger polyp and do not represent new individuals.

Fig. 1.



Arrangement of the mesenteries in a portion of a colony of *Mæandrina labyrinthica*. Two complete stomodæal systems are represented and parts of other two. The septal invaginations at this level are all entocœlic. Partly diagrammatic.

The close similarity in the polypal systems of adult colonies of *Isophyllia*, *Mæandrina*, *Colpophyllia*, &c. to those in *Manicina* and *Favia*, and the like general arrangement of the mesenteries and septa, would lead one to infer a similar course of development for these fission genera—that is, that all have been derived from the continued growth and fission of a single primarily hexameral polyp. A transverse section through a part of the polypal growth of *Mæandrina* is represented in fig. 1 for comparison with the fission-stages in

Manicina. For the present purpose the fragment figured will serve for practically the whole polypal system of a brain-coral, however large. No directives occur, the plane of fission between one polypal system and another is always entocœlic, and the mesenterial pairs usually extend as far as the stomodæum, though sometimes incomplete pairs are found *.

On almost any colony belonging to the genera first mentioned as reproducing by gemmation one or more enlarged polyps may frequently be found exhibiting one stage or another in simple fission. These exceptional cases of fission on gemmiferous colonies will be dealt with in a subsequent paper. It is found that the process differs wholly from that above described for *Manicina.* The resulting polyps are altogether like ordinary gemmation-polyps in that they retain the hexameral cyclical plan and possess two pairs of directives. I endeavour to show that they are best regarded as representing a specialized form of gemmation, not true fission as here understood.

Other than these there seems to be no combination in a species as regards either budding or fission, though such might be reasonably expected. I have come upon no instance of true fission in corals of which the normal method of increase is by gemmation, and, *vice versâ*, no example of budding in polyps which enlarge by fission. Frequently in fissiparous colonies fragments of the polypal system are found wholly isolated from the main mass and appear as if they might have arisen as buds from the wall of the parent; but in sections they exhibit all the characteristics of fission-fragments—that is, they are devoid of directives, and present no hexameral or other cyclical regularity as regards the mesenteries.

We are now in a position to understand the true significance of gemmation and fission as they occur in corals. The complete correspondence as regards the number, character, and arrangement of the tentacles, mesenteries, and septa of bud-polyps with those of polyps reared directly from larvæ shows that the former are to be regarded as altogether new individuals. The parts appear to be formed, as it were, *de novo*, as in the growth of a polyp from the larva. It is otherwise, however, in fission-corals. Only the early larval polyp follows the hexameral cyclic plan, and possesses two pairs of directives. No wholly new individual polyps seem ever to arise by fission; growth consists in an increase in number and size of organs in intimate association with those of the larval polyp, and fission is simply a separation, either partial or complete, of parts of this growth. It is not a separation of parts arising independently; in the early stages of fission the constituent organs of the original larval polyp can be traced as constituents of separate stomodæal systems. Fission does not result in the production of new individuals; it merely divides partially or completely an enlarged growth, and each fragment continues its growth on the same plan until fission may again step in. Even where the products of fission become completely or almost completely separated from one another, as in *Favia*, *Isophyllia*, *Mussa*, and *Lophohelia*, the isolated fragments are not new polyps in the sense in which they are in gemmiferous species; they merely represent a part pinched off an enlarged growth.

---

* Verrill (1901, pp. 65, 68, 71) refers to cases of apparent exothecal budding on the collinal ridges of *Mæandra* (*Mæandrina*). It would be of great interest to determine the actual mode of formation of these as concerns the polyps. According to the view presented in this paper, budding would be established only if the polyps were found to possess directives and the hexameral cyclical plan; the absence of directives and an irregular cyclical plan would denote fission.

A new oral aperture and stomodæum with the associated mesenteries cannot be considered in themselves as constituting a new individual polyp. Only when parts arise *de novo*, or, at any rate, completely reproduce the main essentials of the sexually produced polyp, can they be regarded as additional members of a colony.

It follows, therefore, that the entire polypal system of fissiparous coral, however large, is not made up of individual polyps, but is an enlarged complex growth of the primary larval polyp in which new oral apertures have been formed to meet physiological needs. Morphologically, an enlarged fissiparous coral admits of comparison only with a single individual of a gemmiferous colony; only two pairs of directives occur in each. The former is frequently meandering in character, or by frequent transverse growths may become broken up and assume more the character of separate polyps. A fissiparous coral, whatever its extent or complexity, has not the morphological value of a colony in the sense of being constituted of distinct individuals.

Summary.

a. The bud-polyps of gemmiferous corals arise as new individuals. In the course of their development they pass through the same stages as larval polyps, and ultimately possess all the distinctive characteristics—cyclical hexameral plan and directive mesenteries—of sexually produced polyps.

b. Larval polyps of fissiparous corals at first present a regular cyclical hexameral arrangement of the mesenteries, tentacles, and septa. The first fission partially or wholly divides the polyp into two practically equal parts in an entocœlic plane at right angles to the directive plane, each half having but one pair of directive mesenteries. In the later growth new mesenteries arise in isocnemic pairs more rapidly in some regions than in others, and thus destroy the regularity of the cyclical hexameral plan. Additional oral apertures and stomodæa, with which a variable number of mesenteries are associated, arise at somewhat regular intervals. The various stomodæal systems may remain in continuity with the common gastro-cœlomic cavity, or partitions may be formed in a greater or less number and lead to their partial or complete separation. No new pairs of directives ever arise, so that, however large the polypal system may become, never more than the two primary pairs of directives are present.

c. Morphologically a fissiparous coral, whatever its size, is to be regarded as only a single complex polyp, as contrasted with a gemmiferous colony, which is made up of numerous distinct individual polyps.

References.

1873. Lacaze-Duthiers, H. de. "Développement des Coralliaires. Deux. Mém. Actiniaires à Polypiers," Archiv. de Zool. Exp. et Gén. tom. ii.

1887. Bourne, G. C. "On the Anatomy of *Mussa* and *Euphyllia* and the Morphology of the Madreporarian Skeleton," Quart. Journ. Micr. Sci. vol. xxviii.

1888. Fowler, G. H. "The Anatomy of the Madreporaria.—III.," Quart. Journ. Micr. Sci. vol. xxviii.

1888. Wilson, H. V. "On the Development of *Manicina areolata*," Journ. Morph. vol. ii.

1890. Ortmann, A. "Die Morphologie des Skelettes der Steinkorallen in Beziehung zur Koloniebildung," Zeit. f. wiss. Zool. bd. l.

1896. von Koch, G. 'Das Skelett der Steinkorallen.' Leipzig.

1897. von Koch, G. "Entwicklung von *Caryophyllia cyathus*," Mitt. a. d. zool. Stat. zu Neapel, bd. xii.

1897. Lacaze-Duthiers, H. de. "Faune du Golfe du Lion. Coralliaires. Zoanthaires Sclérodermés," Archiv. de Zool. Exp. et Gén. 3 sér., tom. v.

1901. Vaughan, T. W. "The Stony Corals of the Porto Rican Waters," U.S. Fish. Comm. Bull. for 1900, vol. ii.

1901. Verrill, A. E. "Variations and Nomenclature of Bermudian, West Indian, and Brazilian Reef-Corals, with Notes on various Indo-Pacific Corals," Trans. Conn. Acad. Science, vol. xi.

1902. Duerden, J. E. "The Morphology of the Madreporaria —II. Increase of Mesenteries in *Madrepora* beyond the Protocnemic Stage," Ann. & Mag. Nat. Hist. ser. 7, vol. x.

LIV.—*Descriptions of new Batrachians and Reptiles from the Andes of Peru and Bolivia.* By G. A. Boulenger, F.R.S.

Hyla armata.

Tongue circular, entire, slightly free behind. Vomerine teeth in two very strong, short, transverse series behind the level of the choanæ. Head moderate, broader than long; snout rounded, barely as long as the diameter of the eye; canthus rostralis distinct; loreal region oblique, concave; interorbital region as broad as the upper eyelid; tympanum moderately distinct, about one third the diameter of the eye. Fingers webbed at the base; no projecting rudiment of pollex; toes nearly entirely webbed; disks of fingers rather more than half the diameter of the eye, of toes a little smaller; subarticular tubercles moderate; no tarsal fold. Tibio-tarsal articulation reaching between the eye and the tip of the snout. Upper parts with small smooth warts, belly and lower surface of thighs granular. Greyish brown above, spotted or marbled with darker; sides white, largely marbled with dark brown; hind limb with dark cross-bands separated by narrow light interspaces; lower parts greyish brown. Male with an internal vocal sac, and with large, black, horny, pluricuspid nuptial plates, one under the arm, two close together on the inner side of the inner finger.

From snout to vent 64 millim.

Two specimens, male and female, from La Paz, Bolivia, 4000 m., collected by the late P. O. Simons.

Hyla callipleura.

Tongue subcircular, entire or indistinctly nicked, slightly free behind. Vomerine teeth between the very large choanæ, in two oblique series, forming a chevron pointing forwards. Head moderate, as long as broad or slightly broader than long; snout rounded, as long as the diameter of the eye; canthus rostralis distinct; loreal region oblique, slightly concave; interorbital region as broad as the upper eyelid; tympanum very distinct, three fifths or two thirds the diameter of the eye. Three outer fingers one-third webbed; a distinct rudiment of pollex; toes three-fourths webbed; disks smaller than the tympanum; subarticular tubercles feeble; no tarsal fold. Tibio-tarsal articulation reaching the tip of the snout. Skin smooth above, granular beneath.

Grey or brown above, with or without darker dots, with more or less distinct dark cross-bars, which may enclose light spots, the first of these bars between the eyes; a dark streak on the canthus rostralis and temple; limbs with more or less distinct dark cross-bars; flanks and hinder side of thighs blackish brown, with round white spots, or barred or marbled with white. Bones green. Male with an external gular vocal sac.

From snout to vent 45 millim.

Several specimens were collected by P. O. Simons in Bolivia, at Charuplaya (1350 m.) and at San Ernesto, Mapiri district (500 m.).

This species is closely allied to *H. crepitans*, from which it differs in the narrower interorbital region, the absence of a tarsal fold, and the smaller size.

Phyllomedusa boliviana.

Tongue scarcely emarginate behind. Vomerine teeth in two small, slightly oblique groups between the choanæ. Snout as long as the diameter of the eye, not projecting beyond the mouth; loreal region oblique, concave; interorbital space as broad as the upper eyelid; tympanum three fifths to two thirds the diameter of the eye. Fingers free, first shorter than second, third and fourth equal; toes free, first longer than second; disks of fingers and toes much smaller than the tympanum; subarticular tubercles strong; inner metatarsal tubercle not prominent. The tibio-tarsal articulation reaches the tympanum or the eye. Upper surfaces smooth; parotoids very distinct, nearly as long as the head; throat, belly, and lower surface of thighs granulate. Blue-green above (in spirit); supraciliary edge and lower lip pinkish white, which colour extends backwards to the side of the body, where it forms a broad band speckled with purple; this band does not extend to the groin; thighs green, except below; belly and lower surface of thighs greyish white; throat and lower surface of hands and feet purplish; a pinkish-white streak, edged with purple along the outer side of forearm and outer finger, and another across heel and along outer side of tarsus and outer toe. Male with an internal vocal sac and with a patch of black nuptial asperities on the inner side of the inner finger.

From snout to vent 75 millim.

Two specimens, male and female, from Chulumani, Bolivia, 2000 metres, collected by P. O. Simons.

Bufo Ockendeni.

Crown with feeble bony ridges, including a parietal obliquely directed inwards; snout truncate, slightly projecting; loreal region concave; interorbital region broader than the upper eyelid; tympanum very small, indistinct or hidden. Fingers rather long and slender, first not extending as far as second; toes nearly entirely webbed, with somewhat swollen tips and simple subarticular tubercles; two small metatarsal tubercles; an indistinct tarsal fold. Tarso-metatarsal articulation reaching a little beyond the tip of the snout. Upper parts with small irregular warts; parotoids moderately prominent, oval, about half as long as the head. Olive-grey or brownish above, marbled with darker; limbs with irregular dark cross-bars; lower parts dirty white, spotted or marbled with blackish. Male with an internal vocal sac.

From snout to vent 55 millim.

Several specimens, collected in the Marcapata Valley, E. Peru, by Mr. G. Ockenden, and at Charuplaya, Bolivia, by P. O. Simons.

Hylodes cruralis.

Tongue oval, entire. Vomerine teeth in two round groups on a level with the posterior border of the choanæ. Head slightly longer than broad; snout rounded, as long as the diameter of the orbit; canthus rostralis feeble; loreal region concave; interorbital space as broad as the upper eyelid; tympanum very distinct, two thirds the diameter of the eye. Fingers rather long, first not extending beyond second; toes moderate, with a slight rudiment of web; disks and subarticular tubercles well developed; two very distinct, subequal, round metatarsal tubercles. The tibio-tarsal articulation reaches the tip of the snout. Skin slightly rugose above, with a raised vertebral line; no glandular dorso-lateral fold; belly smooth. Greyish above, with darker symmetrical markings; a round whitish spot between the shoulders; lips with dark vertical bars; limbs with dark cross-bars, which form chevrons pointing backwards on the tibia; lower parts greyish brown.

From snout to vent 28 millim.

A single specimen from La Paz, Bolivia, 4000 m., collected by P. O. Simons.

Near *H. Gollmeri*, Peters.

Atelopus tricolor.

Habit slender. Head longer than broad, about half as long as the trunk, sides vertical; snout very prominent, truncate, longer than the eye; nostril nearer the tip of the snout than the eye; interorbital space much broader than the upper eyelid. Fore limb rather slender; fingers webbed at the base, first very short; toes nearly entirely webbed; no metacarpal, metatarsal, or subarticular tubercles. The tibio-tarsal articulation reaches the eye or between the eye and the tip of the snout. Skin smooth. Black above, with round yellow spots, a yellow streak on each side of back from eye to groin, and a yellow streak round the upper lip; lower parts yellow, with black marblings on the sides and under the limbs and sometimes a few round black spots on the belly; axillary and inguinal regions and palmar and plantar surfaces bright vermilion.

From snout to vent 21 millim.

Several specimens from the Marcapata Valley, E. Peru, collected by Mr. Ockenden.

Prostherapis bolivianus.

Snout short, truncate, with angular canthi and nearly vertical lores; nostril a little nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum distinct, two thirds the diameter of the eye. First and second fingers equal; toes quite free; disks of fingers and toes small; two metatarsal tubercles, inner oval, outer round. The tibio-tarsal articulation reaches the eye. Skin smooth, somewhat granular on the back. Dark grey-brown above, black on the sides of the head and body; a white line borders the upper surface of the head, along the supraciliary edge and round the snout, and extends along the side of the body to the groin; another borders the upper lip and extends to the fore limb; sides of limbs and lower parts white, spotted or marbled with black. Male with an internal vocal sac.

From snout to vent 26 millim.

Two specimens from San Carlos, Bolivia, 1200 m., and one from S. Ernesto, Bolivia, 800 m. Collected by P. O. Simons.

Liolæmus tropidonotus.

Nostril supero-lateral. Upper head-scales small, smooth; two longitudinal series of scales on the frontal region; interparietal and parietals small, subequal; four or five supraoculars feebly enlarged transversely; a single series of scales between the labials and the subocular; two or three projecting granules on the anterior border of the ear. Sides of neck granular, strongly folded. Dorsal scales rather small, rhomboidal, obtusely pointed, as long as broad or slightly longer than broad, strongly keeled, strongly imbricate; lateral scales smaller, smooth or feebly keeled; ventral scales a little larger than dorsals, strongly imbricate, smooth, rounded; 60 to 66 scales round the middle of the body. The adpressed hind limb reaches the shoulder; digits rather short; hinder side of thighs uniformly granular. Male with 5 anal pores. Tail about once and one third as long as head and body; upper caudal scales larger than dorsals, strongly keeled, pointed but not mucronate. Brown or green above, with three light longitudinal streaks with dark bars or square transverse spots between them; lower parts white, belly uniform or with small greyish spots, throat abundantly spotted with blackish; hinder side of thighs with white spots between a dark network.

	millim.
Total length	150
Head	17
Width of head	14
Body	43
Fore limb	24
Hind limb	38
Tail	90

One male and two young from Tinapata, E. Peru, 13,000 feet, collected by Mr. G. Ockenden.

Closely allied to *L. multiformis*, Cope, and *L. annectens*, Blgr. Distinguished by the strongly keeled dorsal scales.

Liolæmus Simonsii.

Nostril supero-lateral. Upper head-scales small, smooth; one to three azygos scales on the frontal region; interparietal and parietals small, subequal; four to six supraoculars more or less enlarged transversely; a single series of scales between the labials and the subocular; two or three more or less distinct projecting granules on the anterior border of the ear. Sides of neck granular, strongly folded. Dorsal scales rather small, rounded, as long as broad or a little broader than long, more or less strongly keeled and imbricate; ventral scales a little larger than dorsals, strongly imbricate, smooth, rounded; 60 to 65 scales round the middle of the body. The adpressed hind limb reaches the ear, or between the shoulder and the ear; digits longer than in the preceding species, the claws more slender; hinder side of thighs uniformly granular. Male with 6 to 8 anal pores. Tail once and a half to once and three fourths as long as head and body; upper caudal scales larger than dorsals, keeled and usually slightly mucronate. Greyish or brownish above, sometimes tinged with orange, usually with blackish and yellow spots, the larger blackish spots in form of more or less regular bars disposed in longitudinal and transverse series; a more or less distinct white band between two black lines on the hinder side of the thighs; lower parts white, throat usually spotted or marbled with blackish.

	millim.
Total length (of male)	170
Head	17
Width of head	13
Body	48
Fore limb	25
Hind limb	42
Tail	105

Numerous specimens from Bolivia, collected by P. O. Simons at Potosi, 4200 m., Challapata, 3700 m., and Uyuni, 3660 m.

Tropidurus melanopleurus.

Upper head-scales smooth; a series of five or six transversely enlarged supraoculars, not quite half as broad as the supraocular region; occipital broader than long, a little broader than the supraocular region; anterior border of ear scarcely denticulated; temples granulate. A strong curved antehumeral fold, narrowly separated from its fellow on the throat; latter distinctly folded, as well as the sides of the neck, which are minutely granulate. Body much depressed; a mere indication of a very slight nuchal crest, not continued on the body; dorsal scales small, rhomboidal, juxtaposed, faintly keeled; lateral scales much smaller still; ventral scales as large as dorsals, subimbricate, smooth. The adpressed hind limb reaches the eye. Tail nearly twice as long as head and body, rounded, without crest, the scales larger than those on the body. Dark olive above, sides of head and body black; a broad yellowish band on each side, from behind the eye to above the groin; throat and antehumeral fold black; belly white.

	millim.
Total length	230
Head	20
Width of head	14
Body	57
Fore limb	37
Hind limb	54
Tail	153

Two female specimens from Tamampoya, Bolivia, 1200 m., collected by P. O. Simons.

This species is closely allied to *T. peruvianus*.

Cnemidophorus vittatus.

Nostril between the two nasals. Three large parietals, and a small outer one on each side; two large supraoculars; 7 or 8 supraciliaries; no frenoorbital; anterior gular scales larger than the posterior; a few enlarged mesoptychial scales. Dorsal scales minutely granular, smooth. Ventral plates in ten longitudinal series. A number of enlarged præanals, the central one largest. Brachials in three rows, continuous with the postbrachials; antebrachials in two rows. Femorals in six series, one of which is large; tibials in three series, outer largest. Femoral pores 9–10. Caudal scales oblique, diagonally keeled. Grey above, sides striped black and white, the widest black stripe extending from the eye to the tail, and reappearing as a line on the canthus rostralis; sides of limbs with black and white stripes; upper lip and lower parts white.

	millim.
Total length	132
Head	12
Width of head	6
From end of snout to interparietal plate	8
Width at posterior corners of supraocular regions	4·5
From end of snout to fore limb	18
From end of snout to vent	47
Fore limb	17
Hind limb	27
Tail	85

A single specimen from Paratani, Bolivia, 2500 m., collected by P. O. Simons.

Oreosaurus ocellifer.

Head short, body and limbs moderate. Frontonasal quadrangular, a little longer than broad; frontal pentagonal, narrower than the frontonasal; interparietal a little larger than the parietals, followed by three small occipitals, forming a triangle; three supraoculars; no loreal; a series of infraorbitals; six upper labials; chin-shields, one anterior and three pairs meeting on the median line; eight series of scales between the chin-shields and the edge of the collar; collar-shields 9. Dorsal scales quadrangular, keeled, more than twice as long as broad; lateral scales smaller, but not granular; 30 scales round the middle of the body, ventrals included; 29 scales from occiput to base of tail. Ventrals large, quadrangular, in eight longitudinal and nineteen transverse series. A pair of large præanals. Femoral pores 7–8. Scales on the tail like those on the body. Brown above, darker on the sides; a yellowish dark-edged streak on each side of the head, behind the eye, and of the anterior part of the back; a series of 7 or 8 black ocelli with small white centres on each side of the body, beginning beneath the light lateral streak; sides of head yellowish, mottled with dark brown; belly uniform yellowish, throat dotted with dark brown.

	millim.
Total length	107
Head	9
Width of head	4·5
From end of snout to fore limb	13
From end of snout to vent	35
Fore limb	9
Hind limb	12
Tail	72

A single specimen from the Marcapata Valley, E. Peru, collected by Mr. Ockenden.

Homalocranium marcapatæ.

Eye half as long as the snout, which is broadly rounded and feebly projecting. Rostral considerably broader than deep, scarcely visible from above; internasals two thirds the length of the præfrontals; frontal pentagonal, more than twice as broad as the supraocular, a little longer than broad, a little longer than its distance from the end of the snout, shorter than the parietals; nostril between two nasals; a small loreal; one præ- and two postoculars; temporals 1+2; seven upper labials, third and fourth entering the eye; first lower labial in contact with its fellow behind the symphysial; four lower labials in contact with the anterior chin-shields, which are slightly longer than the posterior. Scales in fifteen rows. Ventrals 180; anal single; subcaudals 47. Red above, with black cross-bars; on the anterior part of the body these bars are as broad as the interspaces between them, while further back they become narrower; some of them are broken on the vertebral line, the two halves alternating; anterior part of head, parietal shields, and lips black; belly yellowish, with a series of large black spots on each side, alternating with the black cross-bars of the upper surface; lower surface of tail mottled with black.

Total length 390 millim.; tail 72.

A single female specimen from the Marcapata Valley, E. Peru, collected by Mr. Ockenden.

Elaps regularis.

Eye slightly shorter than its distance from the mouth. Rostral large, broader than deep, the portion visible from above measuring one third its distance from the frontal; latter a little broader than the supraocular, once and one third as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals, the length of which equals their distance from the internasals; one præ- and one postocular; temporals 1+1; seven upper labials, third, fourth, and fifth entering the eye; four lower labials in contact with the anterior chin-shields, which are slightly shorter than the posterior. Scales in fifteen rows. Ventrals 214; anal divided; subcaudals 26, the first six single. 39 black annuli disposed with great regularity and as broad as or a little narrower than the interspaces, the scales on which are red with dark brown tips; the first annulus begins immediately behind the parietal shields, which, together with the temporals and the sixth upper labial, are yellow, the rest of the head being black.

Total length 315 millim.; tail 24.

A single specimen from Chulumani, Bolivia, 2000 m., collected by P. O. Simons.

LV.—*On the Genus* Ateleopus *of Schlegel.*

By G. A. Boulenger, F.R.S.

I have already pointed out in these 'Annals'* that the name *Ateleopus*, Schlegel, 1846, for a genus of deep-sea fish from Japan, to which a species from the Indian seas has recently been added, is preoccupied by *Atelopus*, Duméril and Bibron,

---

* Ser. 6, vol. xiv. 1894, p. 374.

1841, a Batrachian genus from South America. I now propose to change the name of the fish to *Podateles* and the family name Ateleopodidæ of Günther to Podatelidæ.

The family Ateleopodidæ has hitherto been placed near the Macruridæ; but it differs from them, and is more nearly related to the Blenniidæ, in having the scapular foramen pierced in the scapular bone, which does not support any of the pectoral rays. It is distinguished from both the Macruridæ and the Blenniidæ in having the supratemporal bone loosely attached by ligament to the skull and the pectoral rays inserted on an undivided cartilaginous plate instead of a series of pterygial bones or basalia.

If, following Gill and other American writers, we attach importance to the structure of the pectoral arch in the classification of the jugular fishes, the Lycodidæ and Ophidiidæ should be placed, with the Zoarcidæ, nearer to the Blennies than to the Gadoids. The point in question had never been ascertained on the Ateleopodidæ, which must now be removed from the immediate vicinity of the Gadoids, and included in the series Blenniidæ—Ophidiidæ.

LVI.—*A new* Rhynchocyon *from Nyasaland.*

By OLDFIELD THOMAS.

Rhynchocyon Hendersoni, sp. n.

A member of the *R. Cirnei–Reichardti* group.

General body-colour grizzled dusky grey, much darker than in *R. Cirnei* and *Reichardti*. On each side of the posterior back two deep black stripes, and below them a third indistinct rufous one; in the hollows of the upper stripe four, of the middle six, and of the lower four indistinct whitish spots, much less conspicuous than in *R. Reichardti*. Head dark, grizzled blackish. Ears dark fulvous, edged with black. Under surface dusky, darker than in the other species, the hairs tipped with buffy. Forearms and thighs dark grizzled fulvous; hands and feet black, the ankles grizzled with fulvous. Tail black, with a white subterminal ring; the underside of its basal two inches fulvous.

Dimensions of the type (measured in skin):—

Head and body 250 millim.; tail 214; hind foot (s. u.) (wet) 67; ear (wet) 27.

Hab. Plateau west of Lake Nyasa.

Type. B.M. no. 2. 9. 8. 1. Collected and presented by the Rev. James Henderson, of the Livingstonia Institution.

Much darker in general tone than either, and with blacker stripes, this species is more or less intermediate in marking between the *R. Cirnei* of Southern Nyasaland and the *R. Reichardti* of the Tanganyika plateau. *R. Stuhlmanni*, Matsch., from the Semliki, has a similar general colour, but has fewer black stripes.

Mr. Henderson was the discoverer of the striking monkey recently described as *Cercopithecus Francescæ*, and is to be congratulated on this second interesting capture.

LVII.—*On new Species of South-African* Curculionidæ *of the Genus* Hipporrhinus, *Schön.* By Guy A. K. Marshall, F.Z.S.

The publication of the following descriptions is the result of a careful examination of all the species of *Hipporrhinus* contained in the British, Stockholm, and Oxford Museums, as well as those in my own collection, and is intended merely as a preliminary to a full revision of this polymorphic genus as soon as I have had access to further expected material. For many of the species here described I am indebted to my good friends Dr. H. Brauns, of Willowmore, Cape Colony, and Dr. Walther Horn, of Berlin, who have generously contributed large numbers of South-African Curculionidæ to my collection: most of the Transvaal species were kindly sent to me some years ago by Dr. J. W. B. Gunning, of the Pretoria Museum; others were captured by myself in Natal and Mashonaland; but the majority of the species are from the fine collections of Pascoe and Jekel contained in the British Museum. Wherever possible, examples in the National Collection have been selected as types; the remainder have been described from my own collection; but the type specimens will shortly be handed over to the British Museum, in order to render them more accessible to other workers. I am indebted to the authorities of that institution for their courtesy in permitting me to take a number of examples from the Museum over to Stockholm, for the purpose of comparison with the types there, which has much facilitated my work. My thanks are also due to my friends Prof. Aurivillius and Prof. Sjöstedt, who kindly afforded me every assistance in their power during my stay in Stockholm.

Hipporrhinus nestor, sp. n.

Long. (excl. apical spines) 20 millim., lat. 8 millim., apical spines 2 millim.

Head convex, with deep scattered punctures and large white scales; forehead with a short central stria; anteocular furrows faint, the lower half obsolete. *Rostrum* not incised at base, as long as head and prothorax, gently curved. Upper surface convex in basal half and broadly excavate near apex, distinctly punctured, and with a broad smooth central line; lateral sulci not meeting at base, broad and deep, separated by a narrow carina, and filled with large white scales; scrobes running beneath base of rostrum; inferior basal furrow shallow. *Antennæ* with scape not nearly reaching eye; the two basal joints of funicle subequal. *Prothorax* slightly transverse, the length about equal to the width at base, which is broader than apex, sides not much rounded, broadest about middle, ocular lobes strongly developed. Upper surface convex, with distant rounded tubercles, which are flattened and arranged in more or less regular rows on disk, smaller more elevated and irregular laterally; central furrow very broad and containing a short faint carina; apices of tubercles black, shiny, and with very short depressed setæ, interstices with dense white scaling. *Elytra* oblongo-ovate, sides scarcely rounded, broadest before middle, shoulders rounded, apical processes very long and sharp. Upper surface convex, striæ with regular rows of small granules, the alternate intervals more prominent: intervals 1, 4, and 6 entirely devoid of tubercles; interval 2 with only a single very large and sharp tubercle on the summit of the declivity; interval 3 with three large, smooth, catenulate tubercles at base, thence with an irregular row of small rounded tubercles to beyond middle, where they become larger and sharply conical, the largest being on the summit of the declivity; this tubercle is of the same size as, and adjoins, that on interval 2, so as to form a conspicuous transverse row of four large tubercles; interval 5 with a very large, rounded, boss-like tubercle at base, followed by two similar but much smaller ones, then five or six small granular tubercles, and finally two or three larger conical ones beyond middle; interval 7 with a complete row of small, closely-set, conical tubercles. *Legs* with dense, even, white scaling; posterior tarsi with the three basal joints of about the same width, second and third subequal, first longer.

CAPE COLONY.

This very distinct insect falls into a small group with *nodulosus*, Fk, and *occidentalis*, Mshl., on account of the large boss-like tubercle at the base of the fifth interval. Apart from their smaller size, these species differ in the presence of a smooth longitudinal space on either side of the thoracic furrow and in the absence of the large conical tubercle on the second interval.

Hipporrhinus occidentalis, sp. n.

Long. 15, lat. 7 millim.

Head convex, obscurely punctured and covered with large brown scales, except a short smooth line on forehead, which contains a small puncture; a narrow ring of white scales round each eye; anteocular furrows practically obsolete. *Rostrum* not incised at base, as long as head and prothorax, very little curved. Upper surface rather convex at base, but broadly excavate towards apex, punctured and covered with brown scales except for a broad smooth central line; lateral sulci not meeting at base and filled with large white scales; upper pair very broad and deep, the lower narrow and faint; scrobes directed beneath base of rostrum; inferior basal transverse furrow obsolete. *Antennæ* with dense pale scaling and black setæ; scape not nearly reaching eye; the two basal joints of funicle subequal. *Prothorax* as long as broad, apex narrower than base, sides slightly dilated, with a small tubercular angulation before middle; ocular lobes strongly developed. Upper surface convex, with a broad lance-shaped central furrow containing a low carina and flanked on either side by two rows of closely but irregularly placed tubercles; beyond these is a smooth longitudinal band, followed by a single regular row of tubercles close to the lateral margin, and below this another similar row, of which a single tubercle is rather larger than the others and forms the lateral projection; scaling on disk brown, but greyish in central furrow and on prosternum. *Elytra* oblongo-ovate, shoulders roundedly prominent, sides very little rounded, broadest about middle, apical processes of elytra long and sharp. Upper surface convex, with regular rows of large and deep punctures, the alternate intervals dissimilar; intervals 1, 2, 4, and 6 devoid of tubercles (except a single small one near base of the latter); intervals 3 and 7 with complete rows of conical tubercles, which become more distant, larger, and sharper towards apex; interval 5 with a very large, rounded, boss-like tubercle at base, followed by six closely-set conical tubercles, and a solitary larger and sharper one about the summit of the declivity; scaling dense, dark brown, except the suture and reflexed margins, which are grey; the boss-like tubercle is entirely bare, the others only so at their apices, which occasionally bear a short depressed seta. *Legs* with dense grey scaling; posterior tarsi narrow, joints of about equal width, second longer than third, and first longer than second.

West Africa (?).

The type in the National Collection is labelled "West Africa," but the locality seems a very doubtful one, and it is more probable that the insect came from South-west Africa. *Occidentalis* is nearly allied to *nodulosus*, F.; but the latter differs in that there is no central carina on the prothorax and the fifth interval on the elytra has only two or three large, distant, conical tubercles in addition to the basal one.

Hipporrhinus fictilis, sp. n.

Long. 14, lat. 6 millim.

Head convex, with close shallow punctures and dense brown scaling, forehead with an elongate central fovea; anteocular furrows deep in their upper half, shallow below. *Rostrum* not incised at base, as long as head and prothorax, slightly curved. Upper surface convex at base, shallowly excavate towards apex, finely and sparsely punctured, with a broad smooth central line; lateral sulci well developed, not meeting at base; scrobes directed to beneath base of rostrum; inferior basal furrow distinct. *Antennæ* with the scape very short, not nearly reaching eye; the two basal joints of funicle short, subequal. *Prothorax* longer than its width at base, which is broader than the apex, sides strongly angulated, broadest before middle, ocular lobes prominent. Upper surface rather convex, with a broad and deep central furrow, containing no carina and flanked by a high narrow ridge composed of agglomerated tubercles; beyond this a broad smooth space, followed by a lateral ridge quite similar to the dorsal one; beneath this are two or three scattered tubercles, including a large compressed one which forms the angular projection; all the tubercles smooth and without setæ; scaling dense and brown, but paler in the median furrow, the prosternum greyish. *Elytra* ovate, shoulders sloping, sides moderately rounded, broadest about middle, apical processes short but sharp. Upper surface convex, with regular rows of large shallow punctures; intervals 1, 2, 4, and 6 entirely devoid of granules or tubercles; intervals 3 and 7 with complete rows of small rounded shiny tubercles, becoming rather larger and more conical towards apex; interval 5 with a similar row, but ceasing abruptly behind middle; intervals 1 and 2 are so narrow that the three spaces between the four dorsal rows of tubercles are of about equal width; scaling dense, uniform earthy brown, margins broadly greyish white. *Legs* with dense pale scaling; posterior tarsi with joints of about the same width, first the longest and third the shortest.

CAPE COLONY.

Of much the same build and facies as *nodulosus*, F., and *occidentalis*, Mshl., but readily separable owing to the absence of the large basal tubercle on interval 5 of the elytra. The species is closely allied to the much larger *canaliculatus*, Mshl. (*vide infrà*).

Hipporrhinus canaliculatus, sp. n.

Long. 22, lat. 10 millim.

Head convex, closely but indistinctly punctured and covered with dense brown scaling; forehead with an elongate central fovea; anteocular furrows deep and distinct in its upper half, obsolete below. *Rostrum* not incised at base, as long as head and prothorax, curved beyond middle; upper surface with the edges angular and subparallel throughout (the genæ dilated at apex as usual), plane at base, shallowly excavate towards apex, with fine close punctuation and sparse scaling throughout, except for a narrow smooth central line; upper lateral sulci entirely dorsal, shallow, not meeting at base and vanishing beyond middle; lower sulci deep and distinct, entirely lateral; scrobes directed beneath base of rostrum; interior basal furrow shallow. *Antennæ* with the scape not reaching eye; the two basal joints of funicle subequal. *Prothorax* as long as its width at base, apex narrower, sides angulated, with a small but prominent lateral tubercle about middle, ocular lobes well developed. Upper surface not very convex, with a broad deep central furrow, containing a strong carina, and flanked on either side by a high ridge of agglomerated tubercles; beyond this is a broad smooth space, followed by a sharply defined band of small irregularly placed tubercles along the extreme edge; scaling dense, brown above and turning suddenly to white on prosternum immediately below the lateral tubercles. *Elytra* ovate, shoulders sloping, sides moderately rounded, broadest about middle, apical processes short but sharp. Upper surface convex, with regular rows of small shiny granules in lieu of punctures; interval 1 granulate; interval 2 with four or five isolated low tubercles; intervals 3 and 5 with small contiguous and usually duplicated tubercles, forming an obtuse carina to beyond middle, after which the tubercles become larger, separate, and sharply conical; 4 and 6 devoid of tubercles; 7 with a complete row of separate conical tubercles, becoming larger towards apex; scaling dark brown, the suture grey, interval 4 wholly and 6 partly white, reflexed margin entirely white. *Legs* with dense pale scaling; posterior tarsi almost devoid of setæ, joints of about the same width, second and third subequal, first longer.

CAPE COLONY.

A distinct species, resembling the *nodulosus* group in general facies, but differentiated by the absence of the boss-like tubercle on the fifth interval on the elytra. Its nearest ally is *fictilis*, Mshl., which differs in having no carina on the prothorax, in having rows of shallow punctures on the elytra instead of granules, in the absence of tubercles on interval 2, and, finally, in *fictilis* the distance between intervals 3 and 5 is about equal to that between the third intervals on the two elytra, whereas in *canaliculatus* the former distance is less than half the latter.

Hipporrhinus incisirostris, sp. n.

Long. 24, lat. 10 millim.

Head convex, closely and finely punctured, forehead flattened and with a very faint central stria; anteocular furrows very deep and distinct. *Rostrum* not incised at base, as long as head and prothorax, moderately curved. Upper surface divided into two portions by a broad and deep transverse incision at about one-third from base; the whole of the basal portion is strongly raised, so as to form a broad, thick, rounded horn, which is distinctly punctured throughout; the upper surface of the anterior portion is broadly excavate, with its edges strongly carinate, and punctured only along the sides and base; upper lateral sulci deep, but narrow and short, ascending the sides of the horn and meeting behind it, but not continued on to the anterior portion; the lower sulci very broad and deep, entirely lateral, and continued from base to the middle of the anterior portion; scrobes directed to beneath base of rostrum; the genæ produced into a prominent sharp point; inferior transverse basal furrow absent. *Antennæ* with scape just reaching eye; the two basal joints of funicle subequal. *Prothorax* rather broader than long, the length greater than the width at base, which again is a little broader than the apex, sides strongly rounded, broadest about middle, ocular lobes almost obsolete. Upper surface almost plane, closely covered with small rounded tubercles, leaving a very indistinct central furrow containing a short but well-marked carina; a distinct transverse dorsal impression just behind apex. Tubercles bare, each with a pale depressed seta; interstices with dense brown scaling. *Elytra* elongato-ovate, shoulders sloping, sides slightly rounded, broadest about middle, the posterior declivity laterally compressed, so that the space between the second intervals on each elytron is distinctly raised, apical processes moderately long and sharp in both sexes. Upper surface convex, faintly striate, the striæ with indistinct punctures separated by small granules; intervals even and with regular rows of granules, except the first, which is smooth throughout, and the lateral compressed portion of the declivity is also almost free from granules; scaling rather thin, variegated brown, paler at sides; setæ pale, very small and much depressed. *Legs* long, rather slender, with sparse pale setæ; posterior tarsi broad, spongy beneath, the joints of about the same width, second and third subequal, first a little longer.

CAPE COLONY.

A remarkable and quite isolated species, which may at once be distinguished from every other member of the genus by the peculiar structure of the rostrum—especially in the character of the basal horn, the transverse dorsal incision, and the acuminate genæ.

Hipporrhinus Horni, sp. n.

Long. 19, lat. 8 millim.

Head convex, with dense light brown scaling on vertex; forehead bare, indistinctly punctured and with a central fovea; anteocular furrows distinct. *Rostrum* not incised dorsally at base, about as long as head and prothorax, slightly curved. Upper surface distinctly convex at base, shallowly excavate at extreme apex only; punctuation indistinct, with broad, smooth, scarcely raised central line throughout; lateral sulci not meeting at base, shallow, the lower pair indistinct; scrobes directed to beneath base of rostrum; inferior basal furrow present, but shallow. *Antennæ* with scape not nearly reaching eye; the two basal joints of funicle subequal. *Prothorax* transverse, the length rather greater than the width at base, which is broader than apex, sides subangulate, broadest about middle. Upper surface slightly convex, with four fairly regular rows of small closely-set tubercles, leaving three large smooth longitudinal spaces; the central one is closely and distinctly punctured and contains no carina, the others are indistinctly punctured; below the outer row of tubercles is a collection of four or five tubercles which form the lateral angulation; tubercles black, shiny, and without setæ. *Elytra* ovate, shoulders sloping, sides moderately rounded, broadest about middle, apical prominences long, sharp, divergent and turning rather upwards. Upper surface convex, with regular rows of small granules, often separated by large, shallow, indistinct punctures: intervals 1, 2, 4, and 6 plane and smooth; interval 3 with a complete row of shiny brown tubercles, as far as the declivity these are small, rounded, irregular, and often duplicated, but on the declivity they are large and sharply conical; interval 5 with a perfectly regular and closely-set row of small, rounded, brown tubercles from base to about middle, where it terminates quite abruptly; interval 7 with a complete row of small subconical tubercles; tubercles bare, shiny, and without setæ. *Legs* with pale scaling; posterior tarsi rather narrow, setose, the joints of about the same width, second and third subequal, first much longer.

Cape Colony.

I have received a single example of this distinct species from my friend Dr. Walther Horn, of Berlin, and there are two others in the British Museum from Jekel's collection. Its only near ally is *H. rubifer*, F.; but this species lacks the lateral smooth spaces on the prothorax; the tubercles on the elytra are larger and further apart, the row on interval 5 is complete and not abruptly interrupted, and interval 2 always has a row of four or five large, depressed, and widely separated tubercles.

Hipporrhinus tricostatus, sp. n.

Long. 13, lat. 6 millim.

Head convex, finely and dispersely punctured, forehead with a small central fovea; anteocular furrows shallow and ill-defined. *Rostrum* not incised at base, about as long as head and prothorax, deflexed and slightly curved. Upper surface without any furrow or carina, convex at base and faintly impressed towards apex, distinctly punctured except for a broad smooth central line; lateral sulci not meeting at base, which is continuous with forehead, the upper pair narrow but distinct, the lower pair almost obsolete; scrobes slightly curved, oblique and directed to beneath base of rostrum; inferior basal furrow absent. *Antennæ* with scape not reaching eye; the two basal joints of funicle subequal. *Prothorax* as long as broad, the length much greater than the width at base, which is about equal to that at apex, sides gradually but strongly dilated from apex and suddenly narrowed near base, broadest far behind middle, ocular lobes strongly developed. Upper surface plane, with a very high, narrow, central carina, and on each side of it a broad, smooth, strongly raised costa, the costæ uniting at apex so as to form an elongate horseshoe, the ends of which are sometimes interrupted near the base; outside the costa is a broad smooth space followed by a lateral row of small closely-set single tubercles, below which is a curved row of three larger tubercles forming the most prominent part of the lateral dilatation; tubercles and costæ black and shiny, interstices with brown scaling. *Elytra* ovate, shoulders sloping, sides moderately rounded, broadest rather before middle, apical processes in female very short but sharp. Upper surface convex, with rows of foveæ, those in adjoining rows often merging so as to give the elytra the appearance of being strongly wrinkled transversely: intervals 1, 4, and 6 entirely without tubercles; interval 2 with a short apical row of four or five sharply conical tubercles; interval 3 with a row of five or six larger subconical tubercles ceasing behind middle; intervals 5 and 7 with complete rows of conical tubercles, those on the former much larger and sharper near apex; tubercles black, shiny, and occasionally with short depressed apical setæ, interstices with uniform brown scaling. *Legs* with sparse pale scaling, forming a denser ring at apex of femora; posterior tarsi narrow, setose, the three basal joints of same width, second and third subequal, first longer.

CAPE COLONY.

I have seen only three examples of this striking species: two in the British Museum and one at Stockholm. The peculiar structure of the thorax will differentiate it from every other species in the genus, the nearest approach to it being found in such species as *canaliculatus*, Mshl., and *fictilis*, Mshl. But the sculpturing of the elytra is, however, very different from that in those species, being rather of the type found in *ferus*, Gyl., and its allies.

Hipporrhinus maculatus, sp. n.

Long. 26, lat. 11 millim.

Head convex, closely shagreened on vertex, punctured in front, with a broad band of elongate yellow scales across forehead and running down in front of eye; forehead with a deep fovea near base of rostrum; anteocular furrows deep and complete, converging dorsally. *Rostrum* not incised at base, as long as head and prothorax, in profile the upper line is straight from base to near insertion of the antennæ, then sharply deflected. Upper surface broadly but very shallowly excavate throughout, with its edges strongly carinate from base to insertion of antennæ, with punctures and yellow scaling at the sides, and a broad, smooth, central line throughout; upper lateral sulci obsolete, the lower ones faint, filled with yellow scaling, and quite hidden from above by the lateral carina; scrobes directed beneath base of rostrum; inferior transverse basal furrow absent. *Antennæ* with dense yellow scaling; scape not quite reaching eye; the two basal joints of funicle subequal. *Prothorax* broader than long, length equal to width at base, apex narrower, sides strongly rounded, broadest about middle, ocular lobes moderately developed. Upper surface almost plane, sparsely covered with large flattened tubercles, leaving a central furrow containing a very short carina and a lateral smooth line on either side; prosternum and the three dorsal lines covered with yellow scaling, the rest bare. *Elytra* ovate, shoulders sloping, sides moderately rounded, broadest about middle, apical processes in female long and sharp. Upper surface convex, the striæ with more or less regular rows of large granules, the intervals unequally tuberculate: interval 1 with elongate depressed tubercles becoming smaller behind and vanishing before apex; intervals 2, 3, and 5 with closely-set, elongate, depressed tubercles to beyond middle, after which they become sharply conical to apex, those on interval 2 being the most prominent; intervals 4, 6, and 7 with smaller separated tubercles, depressed near base and conical towards apex; tubercles and granules quite bare and without setæ, the interstices with small patches of dense yellow scales, forming more or less regular rows of spots along the intervals. *Legs* with dense yellow scaling variegated with numerous bare black spots; posterior tarsi broad, spongy beneath, the joints subequal in length and breadth.

NATAL (*teste* Jekel: more probably Cape Colony).

I have seen only the unique type of this species in the British Museum. It is most nearly allied to *nivosus*, Sparrm., but also bears some resemblance to *insignis*, Fåhr. From both these species it may be distinguished owing to the upper surface of the rostrum having its edges sharply carinate right up to the base, but they are not raised into a sharp angle in front, as is the case with *nivosus*. This latter insect differs further in the presence on the rostrum of the inferior transverse basal furrow, and in the complete absence of tubercles on intervals 4 and 6 of the elytra. However, *maculatus* agrees with *nivosus*, and differs from *insignis*, in having the tubercles on interval 2 more prominent than those on 3.

Hipporrhinus lobatus, sp. n.

Long. 23, lat. 10 millim.

Head convex, with scattered shallow punctures, vertex with dense scaling, forehead bare and with a central fovea; anteocular furrows distinct and complete. *Rostrum* not incised at base, about as long as head and prothorax, strongly curved, its upper edge in profile being in a continuous line with the forehead from base to middle, then very sharply deflexed, almost at a right angle. Upper surface convex at base, deeply excavate anteriorly, its edges being strongly raised in the form of angulated carinæ, punctures large, diffuse, and shallow, leaving a broad smooth central line; lateral sulci shallow and faint, the upper one very narrow and obsolescent; scrobes directed to beneath the base of rostrum; inferior basal furrow absent. *Antennæ* with dense brown scaling; scape not reaching eye; the two basal joints of funicle subequal. *Prothorax* transverse, the length about equal to the width at base, the apex narrower, sides moderately rounded, broadest about middle, ocular lobes strongly developed. Upper surface plane, diffusely set with large elevated rounded tubercles, leaving a broad central furrow containing a distinct short carina; tubercles and carina bare, interstices covered with large round whitish scales. *Elytra* oblong, sides subparallel to beyond middle, shoulders prominent but rounded, a strong impression about apex of fifth interval, apical processes in female short but sharp and divergent. Upper surface slightly convex, striæ with rows of small punctures with more or less distinct intervening granules, intervals uneven: interval 1 with a row of distant granules; interval 2 with an abbreviated row of tubercles from before middle to apex, those on disk small and rounded, those on declivity much larger and sharply conical; intervals 3, 5, and 7 with complete rows of small subconical tubercles, which become larger and more conical near apex; intervals 4 and 6 quite smooth. Tubercles bare and with short pale depressed setæ, interstices with thin brown scaling variegated with grey. *Legs* with dense pale scaling; posterior tarsi with the joints of about the same width, first a little longer than second, and second than third.

Cape Colony.

A distinct species, though clearly falling into the group represented by *ferus*, Gyl., and perhaps most nearly resembling *mammillatus*, Gyl.; but, apart from its much more elongate elytra, the strongly lobate edges of the rostrum will at once distinguish it.

Hipporrhinus brachyceroides, sp. n.

Long. 22, lat. 9 millim.

Head convex, without any central carina or fovea; the punctuation hidden by very dense brown scaling, anteocular furrows distinct. *Rostrum* not incised at base, as long as head and thorax, strongly curved; at base a large stout double horn, the apices of which are divergent. Upper surface with a broad central furrow throughout and thickly covered with large whitish scales. The lateral sulci are broad and distinct, coarsely punctured and filled with scales; the interval between them narrowly carinate; the basal transverse furrow beneath very deep; scrobes directed below base of rostrum. *Antennæ* black, setose; scape not reaching eye; first and second joints of funicle subequal. *Prothorax* as long as broad, apex narrower than base, sides very little rounded, broadest about middle, ocular lobes very strongly developed. Upper surface convex, irregularly set with conical tubercles, leaving a broad central furrow containing a short but strong carina; apices of tubercles bare, each with a puncture containing a depressed seta, interstices with dense variegated scaling. *Elytra* oblong, shoulders prominent, sides subparallel for three-fourths of the length, apical processes very short. Upper surface convex, with regular rows of shallow foveolæ: interval 1 entirely devoid of granules or tubercles; interval 6 with a more or less abbreviated row of tubercles, sometimes wanting; the remaining intervals with regular, complete rows of small, conical, closely-set tubercles—except that on interval 4, which ceases at the summit of the declivity; the tubercles increase slightly in size towards apex, being subcristate on the declivity of the second interval. The entire surface, including the apices of the tubercles, is densely clothed with variegated grey and brown scaling. *Legs* short and thick, densely clothed with light-coloured scales and setæ; second and third joints of posterior tarsi subequal, distinctly shorter than first, all three of about equal width.

CAPE COLONY: Namaqualand.

A very distinct species, approaching the aberrant *Dregei*, Gyl., but, apart from being smaller and of a different colour, the rostral horn is much larger and the apices divergent; the thoracic tubercles are smaller, more conical, and more closely set; the prosternum has a strong conical projection just in front of the anterior coxæ; the large intra-apical tubercular prominence of *Dregei* is represented only by a very slight elevation in *brachyceroides*. The prosternal projection is, so far as I am aware, unique in the genus, although *rubifer*, F., and some of its allies have a slight fold in the same position.

Hipporrhinus oaxus, sp. n.

Long. 23–24, lat. 8½–9 millim.

Head convex, bare, punctuation close but faint on vertex, deeper and more scattered in front; forehead rather retuse, with two faint rounded impressions; anteocular furrows distinct. *Rostrum* cut off from head by a deep dorsal incision, almost as long as head and thorax, distinctly curved, subparallel from base to beyond middle, then gradually dilated to apex. Upper surface convex and without central furrow or carina in basal half, shallowly excavate towards apex, the basal part smooth shiny and with fine sparse punctuation, the punctures much closer and deeper near apex; lateral sulci strong and deep, the intervening carina rather narrow and undulating, the lower pair longer, the upper pair scarcely uniting at base; scrobes lateral, parallel with sulci; inferior basal furrow very broad and deep. *Antennæ* with scape just reaching eye; second joint of funicle longer than the first in male, subequal in female. *Prothorax* rather broader than long, apex about as broad as base, which is equal to the length in female, but narrower in male, sides distinctly rounded, broadest about middle, ocular lobes strongly developed. Upper surface slightly convex, fairly closely set with large elevated rounded tubercles bearing depressed setæ, central furrow narrow and without a carina; no scaling. *Elytra* oblongo-ovate, shoulders rounded, but more prominent in female, sides slightly rounded, broadest before middle, apices slightly and bluntly projecting in male, with sharp parallel processes in female 1 millim. long. Upper surface convex, the dorsal striæ simply punctate, the outer ones granulate, the intervals not equally prominent: interval 1 quite smooth to near declivity, but with strong granules from there to apex; interval 2 quite smooth throughout; 3, 5, and 7 with tubercles strongly depressed to beyond middle, then sharply conical, those on 3 being especially prominent and continued right on to the apical processes in both sexes; intervals 4 and 6 with rows of depressed tubercles ceasing beyond middle; tubercles almost entirely devoid of setæ, the elytra bare and with a strong dull bronze reflexion. *Legs* shiny, tibiæ and tarsi setose; femora finely punctured at base, impunctate in middle, and very coarsely punctured at apex; the posterior and anterior tibiæ strongly curved in male, but especially the former; joints 2 and 3 of posterior tarsi subequal, the first a little longer.

Cape Colony.

This species is certainly a very close ally of *H. verrucosus*, L., but as the fourteen examples which I have examined all retain their distinctive characters, it seems advisable to regard it as a distinct species, at least provisionally. I retain for it Buquet's collection name under which it already stands in all the older collections. The chief points in which it differs from Linné's species are:—(1) the absence of the deep central furrow on the rostrum; (2) the lower lateral sulcus is distinctly longer than the upper and parallel with it, whereas in *verrucosus* it is shorter and the sulci converge apically; (3) the thoracic tubercles are more elevated; (4) the discal punctures on the elytra are deep and simple, whereas in *verrucosus* they are shallow and with a small but distinct granule at the side of each; (5) the discal portions of the intervals 1 and 3 near the base are quite plane and smooth, and not distinctly tuberculate or carinate.

[To be continued.]

LVIII.—*The Specific Name of the Okapi presented by Sir Harry Johnston to the British Museum.* By E. Ray Lankester, M.A., LL.D., F.R.S., Director of the Natural History Department of the British Museum.

Since it appears probable (according to Dr. Forsyth Major's observations) that the skin of the Okapi received in Brussels in May last belongs to a species of the genus *Okapia* distinct from that represented by the entire skin and skull (the larger of the two skulls) sent home by Sir Harry Johnston in the previous year, and now mounted and exhibited in the public gallery of the Museum, and since, moreover, according to Dr. Forsyth Major's observations, the "bandoliers" of striped skin sent home by Johnston at a still earlier date, and named *Equus Johnstoni* by Sclater, belong to the species received in Brussels in May 1902, and not to the species represented by the entire skin and skull sent by Johnston in 1901, it becomes necessary to assign a new name to the latter. This is the skin figured and described in my memoir in the Trans. Zool. Soc. 1902 (vol. xvi.): the larger of the two skulls and the lower jaw there described and figured belong to it. I propose to call this species after the Belgian officer Mr. Eriksson, who obtained it at Sir Harry Johnston's request, as recorded in my memoir above cited. This species will therefore stand as *Okapia Erikssoni*, Lankester. The type is the stuffed skin, skull, and lower jaw now in the Natural History Museum, London. The type of *Okapia Johnstoni*, Sclater, namely the two pieces of skin ("bandoliers") from the hind limbs, is also preserved in this Museum.

Certainty as to the distinctness of these two species and a complete diagnosis of their characters, if they should prove to be, as now supposed, distinct, can only be based on the examination of a large series of specimens.

BIBLIOGRAPHICAL NOTICES.

Palæontologia Indica. New Series. Vol. I. Part 3. *Fauna of the Miocene Beds of Burma.* By FRITZ NOETLING, Ph.D., F.G.S., Palæontologist, Geological Survey of India. Folio. 378 pages, 25 plates. Calcutta: Geol. Survey Office. London: Kegan Paul & Co. 1901.

THE author explains that the fossils here described, besides including those collected by himself from the Irrawadi series and other beds, comprise some collected by the late Mr. Grimes and others by Messrs. Theobald and Fedden in Lower Burma some thirty years ago. He found that the want of any reliable literature on Burmese palæontology was not relieved by any of the published works on Indian fossils. The corals and echinoids are too rare in Burma for Duncan and Sladen's monographs on those of Western India to be of service, and Sowerby's descriptions of Cutch fossils are not sufficiently distinct. The memoir on the fossils of the Nummulitic group of Sind by d'Archiac and Haime he found to be "worse than useless," the fossils of different formations being confused. The type fossils require to be revised and carefully compared with others of authenticated horizons.

Martin's 'Tertiarschichten auf Java,' however, has been of great use to him; and, following Stoliczka's suggestion that the fauna of the Burmese Tertiary System should be compared with the living fauna of the Indian Ocean, F. Noetling has been able, thanks to Major Alcock, to study the great collection in the Indian Museum with highly satisfactory results.

Thus a new line of research has been opened out in the study of the Indian Tertiary System, affording some highly interesting "views regarding not only the origin of the recent fauna of the Indian Ocean, but also of the relation the Miocene of India-Burma had with the older Tertiary System of Europe and the recent fauna of the Western Pacific. In fact, I think that one of the most important of my results," says Mr. Noetling, "is the proof of a migration of species from Europe in an eastern direction, which commenced with the Eocene and probably lasted through the Miocene—a migration which still continued in an eastern direction during the Miocene period in India-Burma, though all direct communication between the Miocene Ocean of Europe and India was disconnected during the Miocene period."

In subdividing the Tertiary System of Burma the author finds that the Upper or Irrawaddi (Pliocene) Series contains the remains of land and freshwater (fluviatile) life, and is based on a conglomerate containing numerous fossil bones, such as those of *Hippotherium* and *Acerotherium*.

(It was on an exposed ledge of this conglomerate that Mr. Noetling discovered, in association with a fossil tooth of *Hippotherium antelopinum*, the stone implement described in 'Natural Science,' vol. x. no. 62, p. 234, 1897.)

The Lower or Arrakan (Miocene) Series in its subdivisions comprehends:—(1) The Upper or Pegu division (Miocene), no Nummulites; (2) The Middle or Bassein division, with Nummulites (Eocene); (3) The Lower or Chin division, without Nummulites (Eocene or Cretaceous?). It is noted that the geology and fossils of the Pegu division have been best known and that those of the Bassein and Chin divisions have not been so closely collected and studied. The Pegu division comprises:—(1) The Yenangyoungian beds, marine, largely littoral, and partly estuarine; and (2) The Promean, of estuarine origin, with its petroleiferous strata.

The description and corellation of the formations and their zones in Lower Burma (pages 17–26) and in Upper Burma (pages 27–38) are followed by tables of the vertical and zonal distribution of the fossil molluscan fauna (pages 19–53). Two hundred and eight species, including some varieties, besides indeterminate forms, are described at pages 101–378.

The relationships of wide territorial types, namely, (1) the Gallic, Pacific, and Mediterranean groups of Palæogene species, and (2) the Identical, Subidentical, and Evolutionary Neogene species (page 98), are defined, and their proportions stated.

The proofs are given of an Eastern migration of European species, assumed by the late H. M. Jenkins in 1864 to have proceeded in Miocene times, but by F. Noetling (in the work before us) as having been in the Eocene period. This extensive subject is carefully and philosophically treated at pages 39–100, and elucidated with elaborate successional and statistical tables.

Noetling agrees with Martin that there is no evidence to warrant the adoption of "Oligocene" for any part of the Indian Tertiary System resting on that regarded as Eocene, whether in Baluchistan, Western India, Burma, Java, Sumatra, or Borneo.

Biologia Centrali-Americana.—Hemiptera-Heteroptera. Vol. II. By G. C. Champion. Pp. xvi & 416. With 22 plates. London, 1897–1901.

The first part of this work, comprising the families Pentatomidæ, Coreidæ, Lygæidæ, Pyrrhocoridæ, and Capsidæ, and elaborated by Mr. Distant, was finished in 1893. The remaining nineteen families of the Heteroptera are worked out by Mr. Champion in the present volume, which includes 592 species—no less than 289 being new, with 30 new genera. With the species enumerated in Vol. I. the total number of Heteroptera recorded in the 'Biologia' is 1715, rather more than half of which have been treated as new.

Mr. Champion's work is not only faunistic, it is much more. The descriptions are excellent, and there is scarcely one among the nineteen families dealt with, not excepting the Aradidæ and Anthocoridæ, in which the author has not succeeded in finding new, hitherto overlooked characters for distinguishing the species. The sexual characters are carefully noted, and in nearly every genus in more than one of the species. The enumeration of the latter is in most cases preceded by a synoptical table, much facilitating their determination.

Mr. Champion is to be congratulated on having so successfully completed this work, the most important contribution to Hemipterological literature published during the last few years.

E. Bergroth.

Gephyrocrinus Grimaldii, *Crinoïde nouveau provenant des campagnes de la 'Princesse Alice.'* By R. Koehler and F. A. Bather. Mém. Soc. Zool. France, xv. pp. 68–79, 4 text-figures. July 1902.

The specimen herein described was dredged by the Prince of Monaco at a depth of 1786 metres near Hierro in the Canaries, and not, as the authors state, "dans les parages des Açores." It is referred to the Hyocrinidæ, a family represented until recently by a single species, *Hyocrinus Bethellianus*, dredged by the 'Challenger.' A second species, not yet described, was found by the 'Valdivia' near Enderby Land, in the Antarctic. The present specimen is therefore of great interest, all the more so since it is considered to form the type of a new genus differing from *Hyocrinus*, and, indeed, from all known crinoids, in the fact that the food-grooves are carried across from the fourth brachials to the orals on a thin unplated membrane stretching like the web of a duck's foot between each arm and the tegmen. The name *Gephyrocrinus* is suggested by this resemblance to a suspension bridge. Minor points of distinction from *Hyocrinus* are the fusion of the basals, the greater thickness of the cup-plates, the almost complete atrophy of the ambulacrals, and the form of the pinnules, which have not the peculiar arrangement characteristic of *Hyocrinus*. These differences have induced the authors to give a fresh diagnosis of the Hyocrinidæ, differing considerably from that in the 'Challenger' Report.

Although the unique specimen of *G. Grimaldii* is small, somewhat imperfect, and naturally cannot be sacrificed for minute dissection, it has been found possible to give a very exact description of all the details of its external anatomy. These have suggested to one of the authors a renewed investigation of the type of *Hyocrinus Bethellianus*, with results that may be published more fully elsewhere.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 60. DECEMBER 1902.

LIX.—*Descriptions of new Fishes from the Collection made by Mr. E. Degen in Abyssinia.* By G. A. BOULENGER, F.R.S.

THE splendid collection of Abyssinian fishes brought home by Mr. E. Degen is one of exceptional interest from the fact that it contains examples of every one of the species described by Rüppell in 1835 *, of which only some of the types are preserved, in a dry condition, in the Senckenberg Museum at Frankfort a. M., and which had not been rediscovered since the expedition of that illustrious zoologist and traveller; and that it has brought to our knowledge the existence in those waters of a Loach, a group of which no African representative was on record, and of an astonishing multiplicity of species of the genus *Barbus*, as well as of two new Silurids of the genus *Clarias*. Twenty-one species are here described as new; fifteen of these belong to the section of which the Nilotic *Barbus bynni* is the type and of which representatives are known to occur in East and South Africa and in the great Central African lakes. The study of these fishes is a bewildering one from the very close affinity which connects them, as I have already pointed out in a recently published paper dealing with the collection made by Mr. Hinde in the Kenia district*; and nothing short of the large series (about 350 specimens) got together by Mr. Degen could have enabled me to estimate correctly, as I believe, the value of the characters which have been regarded by some authors as generic, whilst by others they have been refused even specific importance. Thus, the character on which Rüppell founded his genus *Labeobarbus*, though insufficient for generic separation, is of the greatest value for the distinction of species, as I have ascertained that it is not sexual nor dependent on age in the Abyssinian fishes, since the lips are as much produced in a *Barbus* (*Labeobarbus*) *nedgia* of 6½ inches as in one of 20. The idea expressed by Günther a few years ago†, that adult specimens of *Barbus intermedius* have the lips more developed, is not supported by the evidence available at present, and is clearly the result of an error of determination, since the largest specimen named "*Barbus intermedius*, Rüppell," from East Africa‡, on which this view is founded, measures only 9½ inches, whilst the type of *B. intermedius* from Lake Tsana§, for the loan of which I am indebted to the kindness of the Directors of the Senckenberg Museum, measures 13 and lacks the mental lobe.

---

* The material now available shows *Varicorhinus beso*, Rüpp., to be he same as the fish since described as *Chondrostoma Dilloni*, C & V. *Gobio quadrimaculatus*, Rüpp., should bear the name *Crossochilus quadrimaculatus*, and *Chondrostoma dembeensis*, Rüpp., that of *Discognathus dembeensis*. *Gobio hirticeps*, Rüpp., is not the male of *G. quadrimaculatus*, as suggested by Rüppell, but of *D. dembeensis*, the eye being situated n the posterior half of the head.

It is extremely surprising how fishes, agreeing completely in the form and scaling of the body and in the position and structure of the fins, in the pharyngeal teeth, and also in the skeleton, so far as I have been able to ascertain, may differ very considerably in the proportions of the various parts of the head, the form and development of the lips, and the relative length of the barbels. I trust that the rich material which I have had the privilege of studying has enabled me, through comparisons of numerous specimens of all sizes, to form a more correct estimate of the changes that take place with age, and that the number of species has not been unduly multiplied, although it is, of course, quite possible that some of them are founded on hybrids. In order to facilitate the discrimination of the species of the *Barbus bynni* group here described as new, I append a tentative synopsis of all the African species of that group, one of the most difficult with which it has ever been my lot to deal.

---

* P. Z. S. 1902, ii. p. 221. † P. Z. S. 1894, p. 91.

‡ I propose the name *Barbus Gregorii* for the species referred by Günther to *B. intermedius*, from which it differs in the much-developed lower lip with a rounded median lobe, and in the longer barbels, the anterior measuring 1⅓ to 1¾, the posterior 1⅔ to 2 diameters of the eye. D. IV 8–9; A. III 5; Sc. 31–33 $\frac{5\frac{1}{2}-6\frac{1}{2}}{5\frac{1}{2}}$. In its smaller scales, of which three series intervene between the lateral line and the ventrals, it differs from the other allied species of the Tana system (*B. tanensis*, Gthr., *Hindii*, Blgr., *perplexicans*, Blgr., *labiatus*, Blgr.); in these the number of scales is 25–30 $\frac{4\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}}$, 2 between the lateral line and the ventrals, and the number of branched dorsal rays is 9 or 10. A specimen from the Goi River, in the Degen collection, appears to be referable to *B. Gregorii*.

§ Often written "Tana" on modern maps. I think it desirable to retain the old orthography, in order to avoid confusion with the system of the Tana River further south in East Africa, the fishes of which have much in common with those of the great Abyssinian lake which is the source of the Blue Nile.

Mr. Degen deserves great credit for the manner in which he has collected and preserved in spirit this large and well-selected series of fishes—some as much as 2 feet in length—accompanied by notes and coloured sketches made by him on the spot, which have been of great assistance to me.

The altitude of the localities mentioned in this paper are only approximative, Mr. Degen not having been in a position to determine them with precision.

Synopsis of the African Species of Barbus *related to* B. bynni, *Forsk.*

Dorsal fin with a very strong, bony, non-serrated spine and 8 to 10 branched rays; anal with 5 branched rays *, scales large, 40 or less in the lateral line; barbels four.

A. Sc. 33-40 $\frac{6\frac{1}{2}-7\frac{1}{2}}{5\frac{1}{2}-6\frac{1}{2}}$ 4 †; D. IV 8-9; lower lip continuous across the chin.

Se. 40 $\frac{7\frac{1}{2}}{6\frac{1}{2}}$; barbels not longer than eye; interorbital width 3 times in length of head; lower lip not forming a median lobe...... *B. microterolepis*, Blgr., [p. 426.

Sc. 32-37 $\frac{6\frac{1}{2}}{6\frac{1}{2}}$; barbels 2 to 2½ diameters of eye; interorbital width 2⅔ to 3 times in length of head; lower lip with a median lobe.... *B. macronema*, Blgr, [p. 427.

Sc. 33-36 $\frac{6\frac{1}{2}}{5\frac{1}{2}-6\frac{1}{2}}$; barbels 1½ to 2 diameters of eye; interorbital width 3 to 3½ times in length of head; lower lip not forming a median lobe .... *B. Rueppelli*, Blgr., [p. 427.

Sc. 36-39 $\frac{6\frac{1}{2}}{6\frac{1}{2}}$; barbels not or but slightly longer than eye; interorbital width 2⅔ to 3 times in length of head; dorsal fin nearer caudal than occiput........................ *B. Holubi*, Stdr.

---

* This character excludes the Moroccan species, which agree with the East-African ones in the structure of the dorsal fin, but have 6 or 7 branched rays in the anal.

† The figure or figures after the numbers in the transverse series refer to the series of scales between the lateral line and the ventral fin.

B. Sc. 30–38 $\frac{5\frac{1}{2}-6\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$ 2½–3; D. III IV 8–9.

1. Lower lip not continuous across the chin.

a. Mouth inferior, evenly curved.

α. Anterior barbel 1⅓ to 1½, posterior 1½ to 1¾ diameters of eye; interorbital width 2½ to 3 times in length of head.

Depth of body 2⅔ to 3 times in total length; snout less than ⅓ length of head .... *B. surkis*, Rüpp.

Depth of body more than 3 times in total length; snout more than ⅓ length of head .... *B. Harringtoni*, Blgr., [p. 428.

β. Barbels not more than 1⅔ diameters of eye.

* Ventrals not in advance of origin of dorsal; interorbital width 2½ to 3 times in length of head.

Length of head 3⅓ to 3⅔ times in total length; snout rounded, not more than 1⅓ diameters of eye, which is 3 times in length of head . *B. jarsinus*, Blgr., [p. 429.

Length of head 3¾ to 4½ times in total length; snout rounded, not twice as long as eye, which is more than 3 times in length of head .... *B. intermedius*, Rüpp.

Length of head 4 to 4⅓ times in total length; snout rather pointed, nearly twice as long as eye in the adult .... *B. Fergussonii*, Blgr.

** Ventrals anterior to origin of dorsal.

Interorbital width 2⅓ times in length of head.. *B. Eduardianus*, Blgr.

Interorbital width more than 4 times in length of head .... *B. Breyeri*, M. Weber.

b. Mouth inferior, forming a broken arch, a feebly curved transverse line in front; lips very feebly developed; barbels not longer than eye ...... *B. plagiostomus*, Blgr., [p. 429.

c. Mouth terminal; anterior barbel not longer than eye.

Interorbital width 2⅔ to 3 times in length of head; posterior barbel 1¼ to 1¾ diameters of eye.................................. *B. platystomus*, Blgr., [p. 430.

Interorbital width 3⅓ to 4⅓ times in length of head; posterior barbel not longer than eye. *B. gorguari*, Rüpp. †

2. Lower lip continuous across the chin, sometimes produced into a median lobe.

a. Spine of dorsal fin as long as or longer than head; interorbital width 2½ to 3 times in length of head.

Snout strongly projecting beyond lower jaw; anterior barbel not or but slightly longer than eye; depth of body 2⅓ to 3⅓ times in total length .... *B. bynni*, Forsk.

---

† *B. elongatus*, Rüpp., cannot be separated from *B. gorguari*.

Snout feebly projecting, anterior barbel 1½ as long as eye, depth of body 3⅓ times in total length .... *B. kassamensis*, Blgr., p. 431.

Snout feebly projecting; anterior barbel a little shorter than eye; depth of body 3⅔ to 4 times in total length .... *B. gananensis*, Vincig.

b. Spine of dorsal fin shorter than head; depth of body 3⅓ to 4⅓ times in total length.

α. Anterior barbel shorter than eye, posterior as long as eye or a little longer, interorbital width 3⅓ to 3⅔ times in length of head.

Length of head 3¼ to 3½ times in total length.. *B. brevibarbis*, Blgr., p. 431.

Length of head 4 to 4¼ times in total length . *B. leptosoma*, Blgr., p. 432.

β. Anterior barbel at least as long as eye.

* No subtriangular dermal lobe above the mouth.

† Interorbital width 2½ to 3 times in length of head.

‡ Anterior barbel not or but slightly longer than eye.

Posterior barbel 1¼ to 1⅓ diameters of eye; depth of body equal to length of head, snout 3 times in length of head .... *B. oreas*, Blgr., p. 432.

Posterior barbel not or but slightly longer than eye; depth of body nearly equal to length of head; snout more than 3 times in length of head .... *B. altianalis*, Blgr.

‡‡ Anterior barbel at least nearly 1⅓ as long as eye.

Posterior barbel about 1⅓ diameters of eye; depth of body equal to length of head .... *B. marequensis*, A. Smith.

Posterior barbel 1⅓ to 1⅔ diameters of eye; depth of body greater than length of head ...... *B. Duchesnii*, Blgr., p. 433.

Posterior barbel 1⅔ diameters of eye; depth of body equal to length of head; a subtriangular mental lobe........ *B. mento*, Blgr., p. 434.

†† Interorbital width 3⅓ to 3⅔ times in length of head; anterior barbel 1¼ to 1⅔, posterior 1⅔ to 2 diameters of eye.

Ventrals below origin of dorsal........ *B. Gregorii*, Blgr.

Ventrals posterior to origin of dorsal .... *B. hursensis*, Blgr., p. 434.

††† Interorbital width 3⅓ to 4 times in length of head; barbels 1 to 1⅓ diameters of eye. *B. affinis*, Rupp.

** A subtriangular dermal lobe above the upper jaw; posterior barbels not more than 1⅔ diameters of eye; interorbital width 3⅓ to 3⅔ times in length of head.

Lips not produced into long triangular median

lobes, but snout with a projecting dermal flap .... *B. Deyeni*, Blgr., p. 435.
Both lips produced into long triangular median lobes .... *B. nedgia*, Rupp.

C. Sc. 25–30 $\frac{4\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}}$ 2; D. IV 8–10.

1. Lower lip continuous across the chin; both upper and lower lips produced into triangular median lobes; anterior barbel as long as eye, posterior a little longer .... *B. labiatus*, Blgr.
2. Lower lip interrupted on the chin.
   a. Mouth without horny sheath.
   Anterior barbel 1⅓ to 1⅔ diameters of eye, posterior 1⅔ to 2 .... *B. tanensis*, Gthr.
   Anterior barbel about as long as eye, posterior 1¼ to 1½ diameters of eye .... *B. Hindii*, Blgr.
   Barbels shorter than eye .... *B. oxyrhynchus*, Pfeff.
   b. Lower jaw with a trenchant horny edge; barbels as long as eye, or posterior a little longer .... *B. perplexicans*, Blgr.

Barbus microterolepis.

Depth of body equal to length of head, 3¾ times in total length. Snout rounded, 3⅓ times in length of head; diameter of eye 4 times in length of head, interorbital width 3 times; mouth terminal, its width 4½ times in length of head *; lips moderately developed, the lower continuous; barbels two on each side, anterior ¾ diameter of eye, posterior as long as eye, the distance between them ⅔ diameter of eye. Dorsal IV 8, last simple ray strong, bony, not serrated, slightly curved, a little shorter than head; free edge of the fin strongly emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray ⅔ length of head. Pectoral ¾ length of head, not reaching ventral; latter a little posterior to origin of dorsal. Caudal peduncle 1⅔ as long as deep. Scales 40 $\frac{7\frac{1}{2}}{6\frac{1}{2}}$, 4 between lateral line and ventral, 16 round caudal peduncle. Olive above, silvery beneath; fins greyish.

Total length 135 millim.

A single specimen was obtained at Buggali, from the Maki River, a fast-running stream flowing towards Lake Swai from the eastern slope of the Adami Mountains, in the Addia country, altitude about 4000 feet, March 3, 1902, together with examples of *Barbus affinis*, Rüpp.

This species is remarkable in having the smallest scales among the numerous allies of *Barbus bynni*, Forsk.

---

* *I. e.*, the greatest width of the closed mouth, the lips being lifted if necessary, and not included.

Barbus macronema.

Depth of body 3½ to 3¾ times in total length, length of head 3½ to 4 times. Snout rounded, 3¼ to 3⅓ times in length of head; diameter of eye 6 to 6½ times in length of head, interorbital width 2¾ to 3 times; mouth inferior, its width 3½ to 4 times in length of head; lips well developed, the lower with a very short, rounded or truncate median lobe; barbels two on each side, nearly equal, 2 to 2½ diameters of eye, 1¾ to 2¼ as long as the distance between them. Dorsal IV 8, last simple ray strong, bony, not serrated, feebly curved, about ½ length of head; free edge of the fin emarginate; its distance from the occiput equal to or a little less than its distance from the caudal. Anal III 5, longest ray ⅔ to ¾ length of head, reaching root of caudal, or a little beyond. Pectoral ¾ to ⅘ length of head, not reaching ventral; latter below origin of dorsal. Caudal peduncle 1½ as long as deep. Scales 32–37 $\frac{5\frac{1}{2}}{6\frac{1}{2}}$, 4 between lateral line and ventral, 12 or 14 round caudal peduncle. Olive above, yellowish beneath; fins greyish.

Five specimens measuring 260 to 365 millim.: one was obtained at Gafersa, in the Maki River, altitude about 5000 feet, March 11, 1902; two were procured together at Dedota, altitude about 5500 feet, in the Hawash River, March 16, 1902; and two are from the Hurso River, a fast-running mountain-stream flowing northwards in the Upper Adal country, altitude about 7000 feet, Jan. 17, 1902.

This species has much in common with *B. Gregorii*, Blgr., but differs in the longer barbels and the presence of four series of scales between the lateral line and the ventral fins.

Barbus Rueppelli.

Depth of body equal to length of head, 3⅓ to 3⅗ times in total length. Snout broad, rounded, 3 or 3¼ times in length of head; diameter of eye 4⅓ (young) to 6½ times in length of head, interorbital width 3 to 3⅓ times; mouth inferior, its width 4 times in length of head; lips broad, continued across the chin, but not forming a median lobe; barbels two on each side, anterior 1⅓ to 1¾ diameters of eye, posterior 1¾ to 2, the distance between them equal to or a little exceeding diameter of eye. Dorsal IV 8, last simple ray strong, bony, not serrated, feebly curved, ⅗ to ⅔ length of head; free edge of the fin emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray ⅔ length of head, reaching root of caudal or a little beyond. Pectoral

¾ to ⅘ length of head, not reaching ventral; latter below or slightly posterior to origin of dorsal. Caudal peduncle 1⅓ to 1½ as long as deep. Scales 33–36 $\frac{6\frac{1}{2}}{5\frac{1}{2}-6\frac{1}{2}}$, 4 between lateral line and ventral, 12 or 14 round caudal peduncle. Greenish above, golden on the sides and below; fins yellowish green.

Five specimens, measuring from 180 to 340 millim., from the Errer River, a mountain-stream flowing northwards from the Jebel-Ambar range of mountains, in the Upper Adal country, altitude about 4000 feet, Jan. 20, 1902.

This new species, named in memory of the first explorer of the Abyssinian fish-fauna, is distinguished from the preceding in the shorter barbels and the continuous lower lip, which is not notched on each side to form a median lobe.

Barbus Harringtoni.

Depth of body equal to length of head, 3½ times in total length. Snout rounded, a little more than ⅓ length of head; diameter of eye 8 times in length of head, interorbital width 3 times; mouth large, subinferior, its width 3 times in length of head; lips moderately developed, interrupted on the chin; barbels two on each side, anterior 1⅓, posterior 1½ diameters of eye and as long as the distance between them. Dorsal IV 9, last simple ray strong, bony, not serrated, feebly curved, nearly ½ length of head; free edge of the fin emarginate; its distance from the occiput equal to its distance from the caudal. Anal III 5, longest ray ⅔ length of head, nearly reaching root of caudal. Pectoral ⅘ length of head, not reaching ventral; latter below origin of dorsal. Caudal peduncle 1½ as long as deep. Scales 34 $\frac{5\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Olive above, whitish beneath; fins greyish.

Total length 500 millim. Stated by Mr. Degen to reach double that length.

A single specimen from the Hawash River at Warrar, altitude about 4000 feet, Feb. 6, 1902.

This large Barbel, named in honour of Col. J. L. Harrington, C.B., C.V.O., H.B.M. Consul General at the Court of the Emperor Menelek, is nearly related to *B. surkis*, Rüpp., from which it differs in the less deep body, the longer snout, the larger mouth, and the shorter barbels. The lower pharyngeal bones are much less massive, smaller in fact in this type than in a smaller *B. surkis*; the anterior pharyngeal teeth of the inner row have compressed mammiform crowns instead of the subspherical form assumed by them in *B. surkis*.

Barbus jarsinus.

Depth of body equal to length of head, 3⅓ to 3¾ times in total length. Snout rounded, 3 times in length of head; diameter of eye 3½ to 4½ times in length of head, interorbital width 3 times; mouth inferior, its width 4 times in length of head; lips moderately developed, the labial fold not extending across the chin; barbels two on each side, anterior ¾ to 1 diameter of eye, posterior 1 to 1¼, the distance between them ½ to ⅔ diameter of eye. Dorsal IV 9 (rarely 8), last simple ray strong, bony, not serrated, straight, ⅔ to ¾ length of head; free edge of the fin feebly emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray ⅗ to ⅔ length of head. Pectoral ⅔ to ¾ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle 1½ to 1⅔ as long as deep. Scales 31–34 $\frac{5\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$, 2½ or 3 between lateral line and ventral, 12 or 14 round caudal peduncle. Olive-brown above, silvery on the sides and below; a darker streak along each side of the back; axil of pectoral and of ventral and base of anal bright orange.

Total length 115 millim.

Numerous specimens of this small Barbel were obtained on Jan. 13, 1902, in the Jerrer or rapid mountain-stream five hours' ride from Harrar, flowing from Mount Jarso to the Webi Shebeli, altitude about 6000 feet.

This species is most nearly related to *B. intermedius* of Rüppell. Compared with young specimens (120 millim. long) of the latter, it differs in the longer snout, the smaller eye, the narrower interorbital region, and the shorter dorsal spine.

Barbus plagiostomus.

Depth of body 3½ to 4 times in total length, length of head 4 to 4½ times. Snout rounded, 3 or 3⅓ times in length of head; diameter of eye 4½ to 5 times in length of head, interorbital width 2½ to 2⅔ times; mouth inferior, forming a broken arch, a feebly curved transverse line in front, its width 3 or 3⅓ times in length of head; lips very feebly developed, confined to the sides; a thin horny sheath, with a blunt keel, covers the jaws; barbels two on each side, subequal, as long as or a little shorter than diameter of eye. Dorsal IV 9, last simple ray very strong, bony, not serrated, nearly straight, as long as head or only ⅔ its length; free edge of the fin strongly emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray ¾ to ⅗ length of head, reaching or nearly reaching root of caudal. Pectoral as long as or a little shorter than head, not reaching ventral; latter a little posterior to origin of dorsal. Caudal peduncle $1\frac{2}{3}$ to $1\frac{3}{4}$ as long as deep. Scales $33\,\frac{5\frac{1}{2}}{6\frac{1}{2}}$, 3 between lateral line and ventral, 12 or 14 round caudal peduncle. Silvery, darker on the back; pectoral and ventral fins flesh-coloured; iris nearly white, with a fine yellow ring round the pupil.

Total length 220 millim.

Three specimens of nearly the same size, one from the Gota River at Marmusa, Jan. 21, 1902, and two from the Kassam River at Awhorra Mullka in Shoa, altitude about 4000 feet, Feb. 7, 1902.

Like the recently described *B. perplexicans* from the Tana system, this fish might be referred to the genus *Capoëta* as defined by Günther; but this, it seems to me, would be in violation of the natural affinities, which are with *B. intermedius*, Rüpp., just as those of *B. perplexicans*, Blgr., are with *B. tanensis*, Gthr., and *B. Hindii*, Blgr. Nevertheless, *Barbus plagiostomus* evidently constitutes a connecting-link between *B. intermedius* and *Varicorhinus beso* of Rüppell.

Barbus platystomus.

Depth of body $3\frac{1}{2}$ to $3\frac{4}{5}$ times in total length, length of head 4 to $4\frac{1}{4}$ times. Snout very broad, rounded, not quite $\frac{1}{3}$ length of head; diameter of eye 5 to $5\frac{1}{2}$ times in length of head, interorbital width $2\frac{3}{4}$ to 3 times; mouth large, terminal, its width 3 times in length of head; lips moderately developed, interrupted on the chin; barbels two on each side, anterior as long as the eye, posterior $1\frac{1}{4}$ to $1\frac{2}{3}$ diameters of eye, the space between them as long as the eye. Dorsal IV 8–9, last simple ray very strong, bony, not serrated, feebly curved, $\frac{3}{5}$ to $\frac{4}{5}$ length of head; free edge of the fin emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray $\frac{3}{4}$ to $\frac{4}{5}$ length of head, reaching or nearly reaching root of caudal. Pectoral $\frac{5}{8}$ to $\frac{7}{8}$ length of head, not reaching ventral; latter a little posterior to origin of dorsal. Caudal peduncle $1\frac{3}{4}$ as long as deep. Scales 35–37 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Bluish or steel-blue above; fins of a dark slate-colour; iris yellow or orange.

Two specimens, measuring 245 and 310 millim. respectively, from Bahardar, Lake Tsana, altitude about 5500 feet, June 4, 1902.

Intermediate between *B. Harringtoni* and *B. gorguari*, Rüpp. Distinguished from the latter by the much broader snout and the broader interorbital region. The lower pharyngeal bones are relatively small, as in *B. Harringtoni*, from which they do not differ in the dentition.

Barbus kassamensis.

Depth of body 3½ times in total length, length of head 4 times. Snout rounded, 3⅓ times in length of head; diameter of eye 4½ times in length of head, interorbital width 3 times; mouth inferior, its width ¼ length of head; lips moderately developed, lower continuous across the chin but not produced into a lobe; barbels two on each side, anterior 1½ diameters of eye, posterior 1⅔, the distance between them ⅗ diameter of eye. Dorsal IV 8, last simple ray very strong, bony, not serrated, as long as the head; free edge of the fin emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray a little shorter than head and reaching root of caudal. Pectoral as long as head, nearly reaching ventral; latter below anterior rays of dorsal. Caudal peduncle 1⅓ as long as deep. Scales 30 $\frac{5\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Olive-brown above (in spirit), the scales edged with darker, yellowish beneath; fins greenish yellow.

Total length 225 millim.

A single specimen from the Kassam River at Awhorra Mullka, Shoa, altitude about 4000 feet.

Very closely allied to *B. bynni*, Forsk. Distinguished by a less prominent snout, less developed lips, longer barbels, and a less deep body.

Barbus brevibarbis.

Depth of body 3½ to 3⅔ times in total length, length of head 3⅓ to 3½ times. Snout rounded, 3 times in length of head; diameter of eye 4 (young) to 6½ times in length of head, interorbital width 3½ to 3⅔ times; mouth inferior, its width 4½ times in length of head; lips much developed, the lower forming a short rounded lobe in the middle; barbels two on each side, the anterior ⅗ to ¾ diameter of eye, the posterior as long as eye and as long as or a little longer than its distance from the anterior. Dorsal IV 9, last simple ray very strong, bony, not serrated, straight or very slightly curved, ⅔ to ¾ length of head; free edge of the fin emarginate; its distance from the occiput equal to or a little less than its distance from the caudal. Anal III 5, longest ray ⅗ length of head. Pectoral about ⅘ length of head, not reaching ventral; latter below or slightly posterior to origin of dorsal. Caudal peduncle 1⅔ as long as deep. Scales 31–33 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, 2½ or 3 between lateral line and ventral, 12 round caudal peduncle. Bluish olive above, yellowish beneath; fins dark slate-colour; iris deep yellow.

Four specimens, measuring 350, 250, 150, and 130 millim. respectively, were obtained in Lake Tsana, the largest at Zegi, May 31, 1902, the three others at Bahardar, June 4, 1902.

This species is near *B. nedgia*, Rüpp., from which it is distinguished by the lesser development of the lips and the shorter barbels.

Barbus leptosoma.

Depth of body 3¾ to 4⅓ times in total length, length of head 4 to 4¼ times. Snout rounded, 3⅓ to 3½ times in length of head; diameter of eye 4 to 4⅔ times in length of head, interorbital width 3⅕ to 3⅓ times; mouth inferior, its width 4½ to 5 times in length of head; lips moderately developed, continuous across the chin; barbels two on each side, subequal, as long as the eye or a little shorter, longer than the distance between them. Dorsal III 8–9, last simple ray very strong, bony, not serrated, straight or slightly curved, as long as or slightly shorter than the head; free edge of the fin emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray ⅔ length of head. Pectoral ⅘ to ⅞ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle twice or nearly twice as long as deep. Scales 30–35 $\frac{5\frac{1}{2}-6\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Silvery in life, tinged with a vivid blue; the belly and fins whitish, tinged with carneous.

Three specimens, two measuring 225 millim., the third 160, from Zegi, Lake Tsana, May 18 and 19, 1902.

Distinguished from *B. brevibarbis* by the more elongate form, the shorter head, the thinner lips, and the longer spine of the dorsal fin.

Barbus oreas.

Depth of body equal to length of head, 4 times in total length. Snout rounded, 3 times in length of head; diameter of eye 4½ to 5 times in length of head, interorbital width 3 times; mouth inferior, its width 4 times in length of head; lips much developed, the lower forming a short rounded median lobe; barbels two on each side, anterior slightly longer than eye, posterior 1¼ to 1⅓ as long as eye, the distance between them, ⅔ diameter of eye. Dorsal IV 9, last simple ray strong, bony, not serrated, straight, ⅗ or ⅔ length of head; free edge of the fin emarginate; its distance from the occiput less than its distance from the caudal. Anal III 5, longest ray ⅔ length of head. Pectoral ¾ or ⅘ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle 1¾ or twice as long as deep. Scales 33 $\frac{5\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$, 2½ between lateral line and ventral, 12 or 14 round caudal peduncle. Olive above, silvery on the sides and below; dorsal and caudal fins greyish.

Total length 170 millim.

Two specimens from the Jerrer, near Harrar (ca. 6000 feet), Jan. 13, 1902.

Very nearly related to *B. gananensis*, Vincig., from the Ganana and Auata Rivers, Somaliland; distinguished by the smaller eye, the narrower interorbital space, the shorter spine of the dorsal, and the longer caudal peduncle.

Barbus Duchesnii.

Depth of body 3⅓ to 3½ times in total length, length of head 4 to 4¼ times. Snout rounded, 3 to 3⅓ times in length of head, interorbital width 3 times; mouth inferior, its width 4 times in length of head; lips moderately developed, the lower continuous; barbels two on each side, subequal, 1⅔ to 1¾ diameters of eye. Dorsal IV 9, last simple ray very strong, bony, not serrated, straight or very slightly curved, ¾ to ⅘ length of head; free edge of the fin strongly emarginate; its distance from the occiput a little less than its distance from the caudal. Anal III 5, longest ray ⅚ length of head, reaching or nearly reaching root of caudal. Pectoral nearly as long as head, narrowly separated from ventral; latter below anterior rays of dorsal. Caudal peduncle 1½ as long as deep. Scales 30–33 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, 2½ between lateral line and ventral, 12 round caudal peduncle. Colour iridescent green and blue in life; all the fins dark slate-colour; iris dark, with a fine yellow circle round the pupil.

Total length 300 millim.

Two specimens: the larger from Bahardar, Lake Tsana, June 2, 1902; the other (250 millim. long) from the Moger River, a tributary of the Blue Nile, in Shoa, altitude about 4000 feet, April 17, 1902.

Named after M. J. Duchesne-Fournet, the chief of the French Scientific Mission of that name, who most kindly assisted Mr. Degen with advice during his stay on Lake Tsana.

B. Duchesnii is related to *B. affinis*, Rüpp., but differs chiefly in the longer barbels and the broader interorbital region.

Barbus mento.

Depth of body equal to length of head, 3¾ times in total length. Snout rounded, 3 times in length of head; diameter of eye 6 times in length of head, interorbital width 3 times; mouth inferior, its width 4 times in length of head; lips very strongly developed, the lower produced into a subtriangular median lobe which is as long as the eye; anterior barbel 1½, posterior 1⅔ diameters of eye, the space between them a little greater than diameter of eye. Dorsal IV 8, last simple ray very strong, bony, not serrated, slightly curved, ½ length of head; free edge of the fin emarginate; its distance from the occiput a little less than its distance from the caudal. Anal III 5, longest ray ¾ length of head, reaching root of caudal. Pectoral ¾ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle 1⅔ as long as deep. Scales $35\frac{6\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Olive above, yellowish beneath; fins greyish.

Total length 300 millim.

A single specimen obtained at Marmasa (alt. nearly 5000 feet) in the Gota River, flowing northwards from the Jebel-Ambar Mountains, Jan. 21, 1902.

Barbus mento may be compared with *B. nedgia*, Rüpp., from which it differs in the broader head, the broader interorbital region, and the lesser development of the lips. It differs from *B. Duchesnii* in the less elevated body and the longer mental lobe.

Barbus hursensis.

Depth of body equal to length of head, 3¾ or 4 times in total length. Snout obtusely conical, 3 times in length of head; diameter of eye 5 times in length of head, interorbital width 3½ times; mouth inferior, its width 4 times in length of head; lips strongly developed, the lower forming a rounded median lobe; anterior barbel 1½, posterior twice as long as eye, the distance between them a little less than diameter of eye. Dorsal III 8–9, last simple ray strong, bony, not serrated, curved, ⅗ or ⅔ length of head; free edge of the fin emarginate; its distance from the occiput a little less than its distance from the caudal. Anal II 5, longest ray ⅔ length of head, reaching root of caudal. Pectoral ¾ or ⅘ length of head, not reaching ventral; latter somewhat posterior to origin of dorsal. Caudal peduncle 1⅓ or 1½ as long as deep. Scales 32–34 $\frac{5\frac{1}{2}-6\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 12 or 14 round caudal peduncle. Olive above, golden on the sides; fins yellowish green; iris golden yellow.

Total length 210 millim.

Two specimens from the Hurso River, Upper Adal country, altitude about 7000 feet, Jan. 17, 1902. A third badly preserved specimen from the Gota River probably belongs to the same species.

The longer barbels and the broader interorbital space distinguish this species from Rüppell's *B. affinis*, to which it is most nearly related.

Barbus Degeni.

Depth of body 3⅔ to 4⅓ times in total length, length of head 3½ to 3⅔ times. Snout pointed, 2⅔ to 3 times in length of head; diameter of eye 5 to 8½ times in length of head, interorbital width 3½ times; snout produced into a triangular dermal flap overhanging the lip; mouth inferior, its width 4½ to 5½ times in length of head; lips very strongly developed, the lower produced into a rounded median lobe which measures ½ to ⅔ the diameter of the eye; anterior barbel 1 to 1⅓, posterior 1⅓ to 1½ diameters of eye, the space between them equal to or a little less than diameter of eye. Dorsal IV 9, last simple ray very strong, bony, not serrated, straight or slightly curved, ⅓ to ⅔ length of head; free edge of the fin emarginate; its distance from the occiput a little less than its distance from the caudal. Anal III 5, longest ray ½ to ⅔ length of head, reaching or nearly reaching root of caudal. Pectoral ⅔ to ¾ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle 1½ to 1⅔ as long as deep. Scales 31–35 $\frac{5\frac{1}{2}-6\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$, 2½ or 3 between lateral line and ventral, 12 round caudal peduncle. Head and upper part of body dark slate-colour, sides dark green, belly yellowish green in life; caudal green, other fins steel-grey; iris dark bronzy.

Four specimens, measuring 225 to 450 millim., from Lake Tsana. The largest was obtained at Zegi, May 27, 1902, the others at Bahardar, June 1 and 4, 1902.

This fine *Barbus* is closely allied to *B. nedgia*, differing in the less developed mental lobe and the absence of an upper labial lobe, which is replaced by a similar appendage formed by the skin of the snout above the lip.

Barbus pleurogramma.

Depth of body equal to length of head, 4 times in total length. Snout rounded, $4\frac{1}{2}$ times in length of head; diameter of eye 3 to $3\frac{1}{2}$ times in length of head, interorbital width 3 times; mouth terminal, its width $4\frac{1}{2}$ times in length of head; lips feebly developed; barbels two on each side, the anterior barely $\frac{1}{2}$ diameter of eye and longer than its distance from the posterior, which measures nearly $\frac{3}{4}$ diameter of eye. Dorsal III 7, last simple ray bony, strongly serrated behind, $\frac{3}{4}$ length of head; free edge of the fin not emarginate; its distance from the occiput a little less than its distance from the caudal. Anal III 5, longest ray $\frac{3}{5}$ length of head. Pectoral $\frac{2}{3}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle twice as long as deep. Scales $35\,\frac{6\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 16 round caudal peduncle. Silvery, brownish on the back; a black line along each side of the body; fins greyish.

Total length 40 millim.

Three specimens from Bahardar, Lake Tsana, June 4, 1902, and one from the Unfras River, Lake Tsana, May 9, 1902.

Near the East African *B. paludinosus*, Peters, in which, however, the dorsal fin originates behind the vertical of the base of the ventrals.

Barbus humilis.

Depth of body $3\frac{1}{3}$ to $3\frac{3}{4}$ times in total length, length of head $3\frac{2}{3}$ to 4 times. Snout rounded, 4 times in length of head; diameter of eye 3 to $3\frac{1}{2}$ times in length of head, interorbital width $2\frac{1}{2}$ to $2\frac{2}{3}$ times; mouth terminal, its width 4 times in length of head; lips feebly developed; barbels two on each side, the anterior about $\frac{1}{2}$, the posterior $\frac{2}{3}$ diameter of eye, the space between them hardly $\frac{1}{2}$ diameter of eye. Dorsal III 8, last simple ray not enlarged, flexible, as long as head; free edge of the fin emarginate; its distance from the occiput about $\frac{2}{3}$ its distance from the caudal. Anal III 5, longest ray $\frac{3}{5}$ length of head. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle twice as long as deep. Scales 29–31 $\frac{4\frac{1}{2}}{4\frac{1}{2}}$, 2 between lateral line and ventral, 12 or 14 round caudal peduncle. Silvery, brownish on the back; an indistinct darker lateral band; fins whitish.

Total length 65 millim.

Numerous specimens from Bahardar, Lake Tsana, June 4, 1902.

The nearest ally of this small Barbel appears to be *B. inermis*, Peters, the dorsal of which originates in front of the vertical of the base of the ventrals.

Barbus trispilopleura.

Depth of body equal to length of head, $3\frac{1}{2}$ times in total length. Snout rounded, 4 times in length of head; diameter of eye 3 times in length of head, interorbital width $2\frac{1}{2}$ times; mouth terminal, its width $4\frac{1}{2}$ times in length of head; lips feebly developed; barbels two on each side, the anterior $\frac{2}{3}$, the posterior a little longer than diameter of eye. Dorsal III 7–8, last simple ray not enlarged, flexible, as long as head; free edge of the fin not emarginate; its distance from the occiput about $\frac{2}{3}$ its distance from the caudal. Anal III 5, longest ray $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Pectoral $\frac{2}{3}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle $1\frac{2}{3}$ as long as deep. Scales 27–28 $\frac{4}{4\frac{1}{2}}$, 2 between lateral line and ventral, 12 round caudal peduncle. Brownish above, silvery on the sides and below; three round black spots on each side of the body, the first and second above the lateral line, the third on the lateral line at the base of the caudal.

Total length 45 millim.

Three specimens from Bahardar, Lake Tsana, June 4, 1902.

Resembles *B. trimaculatus*, Peters, in general appearance, but the scales are fewer, the last unbranched dorsal ray is weaker, and the barbels are shorter.

Nemachilus abyssinicus.

Depth of body 7 times in total length, length of head 5 times. Head feebly compressed behind, twice as long as broad. Snout a little shorter than postorbital part of head, a little depressed; eye $6\frac{1}{2}$ times in length of head, $\frac{2}{3}$ interorbital width; longest barbels twice diameter of eye. Dorsal 10, a little nearer caudal than occiput, originating immediately behind vertical of root of ventral, middle rays longest, nearly $\frac{3}{4}$ length of head. Anal 9. Caudal slightly emarginate. Caudal peduncle $1\frac{1}{2}$ as long as deep. Yellowish brown, with irregular dark spots, and a series of 10 large transverse dark spots along the back; a small round black spot on the dorsal; caudal with dark spots.

Total length 40 millim.

A single specimen from Bahardar, Lake Tsana, June 4, 1902.

This is the first known African representative of the Cobitidinæ. It belongs to a genus of wide distribution in Europe and Asia, and its nearest ally appears to be *N. Leontinæ*, Lortet, from the Lake of Galilee.

Clarias tsanensis.

Depth of body 6½ to 7½ times in total length, length of head 3⅕ to 3⅘ times. Head 1½ to 1⅔ as long as broad, perfectly smooth above; vertex very strongly flattened, almost concave in the adult; occipital process angular; frontal fontanelle knife-shaped, 3 to 4 times as long as broad, 4 to 5 times in length of head; occipital fontanelle indistinct; eye small, 2½ (young) to 4 times in length of snout, 4 (young) to 6 times in interorbital width; width of mouth equal to interorbital width, ½ length of head. Band of præmaxillary teeth 4 to 5½ times as long as broad; vomerine teeth granular, forming a crescentic band, which is as broad as the præmaxillary band. Nasal barbel ⅓ to ½ length of head (¾ in the very young); maxillary barbel ¾ to 1 length of head (longer in the very young), reaching base or extremity of pectoral spine; outer mandibular barbels ½ to ⅗ length of head (as long as head in the very young). Gill-rakers fine and closely set, 60 to 70 on first arch (45 in young). Dorsal 78–85, its distance from the occipital process ⅕ to ¼ length of head, its distance from the caudal hardly equal to the diameter of the eye. Anal 60–70, touching root of caudal. Pectoral not quite ½ length of head, the spine very slightly serrated on the outer border, ⅗ (young) to ⅔ the length of the fin. Ventral equally distant from end of snout and from caudal, or a little nearer the former. Caudal nearly ½ length of head. Dark olive-brown above, greyish beneath.

Five specimens, measuring 125 to 430 millim., from Zegi, Lake Tsana, May 12 and 22, 1902.

The smooth head, combined with the high number of gill-rakers and of dorsal rays, and the absence of a space between the anal and caudal fins, distinguish this species from its allies with granular vomerine teeth.

Clarias Vinciguerræ.

Depth of body 7 times in total length, length of head 3 times. Head $1\frac{4}{7}$ as long as broad, its upper surface strongly granulated; occipital process angular; frontal fontanelle knife-shaped, 3½ times as long as broad, 4½ times in length of head; occipital fontanelle small, in advance of occipital process; eye small, 3 times in length of snout, 5½ times in interorbital width; width of mouth a little less than interorbital width, ⅔ length of head. Band of præmaxillary teeth 5½ times as long as broad; vomerine teeth granular, forming a crescentic band which is as broad as the præmaxillary band. Nasal barbel ⅖ length of head; maxillary barbel slightly shorter than head, reaching base of pectoral fin; outer mandibular barbel ⅔ length of head, inner ⅖. Gill-rakers fine and closely set, about 90 on first arch. Dorsal 67, its distance from the occipital process ⅙ length of head, its distance from the caudal 2 diameters of eye. Anal 53, narrowly separated from the caudal. Pectoral not quite ½ length of head, the spine finely serrated on the outer border, 2/7 the length of the fin. Ventral a little nearer end of snout than caudal. Latter nearly ½ length of head. Dark brown above, whitish beneath; anal and caudal with a fine light edge.

Total length 410 millim.

A single specimen from the Kassam River at Awhorra Mullka, Shoa, about 4000 feet, Feb. 7, 1902.

This species, named after Dr. D. Vinciguerra, is closely related to *C. Robecchii*, Vincig., from which it is distinguished, as well as from *C. lazera* and other species with granular vomerine teeth, by the narrower head and by the shorter interspace between the occiput and the origin of the dorsal fin; the gill-rakers are more numerous than in *C. Robecchii*, resembling those of *C. lazera*, in which the vomerine teeth form a wider band.

LX.—*On new Species of South-African* Curculionidæ *of the Genus* Hipporrhinus, *Schön.* By GUY A. K. MARSHALL, F.Z.S.

[Concluded from p. 417.]

Hipporrhinus janus, sp. n.

Long. (excl. apical spine) 19, lat. 8½ millim. Length of apical spines 1 millim.

Head convex, with scattered shallow punctures on vertex, much deeper and coarser on forehead, which is retuse and has a short central carina; anteocular furrows deep and complete. *Rostrum* cut off from head by a deep dorsal incision, as long as prothorax only, deflected and scarcely curved, subparallel for two-thirds of its length, thence dilated to apex. Upper surface convex, with five narrow and undulating carinæ, the central being higher and also rather shorter than the others; the lateral sulci broad and deep, the lower pair longer, the upper pair meeting at base; scrobes not purely lateral, but continued to beneath base of rostrum; inferior basal sulcus deep. *Antennæ* piceous, finely squamose; scape just reaching eye; the two basal joints of funicle subequal. *Prothorax* a little broader than long, the length greater than the width at base, which is broader than apex; sides moderately rounded, broadest about middle, ocular lobes strongly developed. Upper surface slightly convex, closely set with small rounded tubercles having scarcely perceptible setæ, central furrow very narrow and without a carina; tubercles bare, shiny, interstices with whitish scaling forming three ill-defined stripes. *Elytra* broadly ovate, shoulders prominent and subrectangular, sides very little dilated, broadest much before middle, apical processes long and sharp. Upper surface convex, with shallow sulci containing regular rows of granules, which are very much reduced towards apex; the intervals with single rows of small tubercles, which are depressed and rather elongate in the dorsal area, but elevated towards the sides and apex; the tubercles shiny and mostly without setæ, the interstices with scattered patches of whitish scaling, the scales being very large and circular. *Legs* with sparse scaling and pale setæ; the three basal joints of posterior tarsi subequal; the onychium elongate, about equal to the three preceding joints together.

CAPE COLONY (*Colls. Pascoe & Jekel*).

A striking species superficially resembling *H. obesus*, Gyl., and *H. verrucellus*, Gyl., but readily recognized by the presence of a strong central carina on the rostrum and by the long apical spines. *H. corpulentus*, Gyl., which has the rostral carina, has a very different appearance, owing to the even granulation throughout the elytra obliterating the sulci; its apical processes also are very short and tuberculiform.

Hipporrhinus congestus, sp. n.

Long. 13, lat. 7 millim.

Head convex, rugosely punctured, some of the punctures containing a single large white scale, forehead not flattened, coarsely strigose and with a short central stria; anteocular furrows deep and complete. *Rostrum* separated from head by a deep dorsal incision, as long as the thorax only, distinctly curved, subparallel to beyond middle, then slightly dilated. Upper surface convex, with a deep narrow central furrow throughout having a broad and coarsely punctured costa on either side; both pairs of lateral furrows are deep and distinct, being of equal length; the intervening carina is narrow and impunctate; the upper sulci alone meet at the base, which is not elevated; the scrobes are quite lateral, and almost parallel to the sulci; the inferior basal furrow is strongly developed. *Antennæ* black, setose; scape just reaching eye; the two basal joints of funicle subequal. *Prothorax* nearly as long as broad, the length equal to the width at base, apex much narrower, sides very little rounded, slightly diverging from base to near apex, then rapidly narrowing, broadest well before middle. Upper surface convex, closely set with large rounded shiny granules, leaving a very narrow central stria without any carina; granules without setæ; scaling almost absent; ocular lobes strongly developed. *Elytra* short ovate, shoulders prominent and almost rectangular, sides strongly rounded, broadest about middle, apical processes short and blunt in female. Upper surface convex, with no distinct striation, the whole surface being equally covered with even and regular rows of rounded granules, except for a tubercular prominence on the declivity of the third interval (as in *albicinctus*, Gyl.) and a much lower elongate one on the declivity of interval 5; a few isolated white scales are scattered about the surface, but they are more numerous near the margins. *Legs* black, with scattered white scales and black setæ; the tubercles on the inner edges of tibiæ large and tooth-like; posterior tarsi setose, the three basal joints subequal.

SOUTH AFRICA (*Sir A. Smith*).

A very distinct species allied to *corpulentus*, Gyl., from which it may be distinguished at once by the presence of the tubercular prominences on the declivity and the absence of a central carina on the rostrum. On account of these prominences it also bears some resemblance to *albicinctus*, Gyl.; but the granulation is much finer than in that species, the shoulders are not produced forwards, and the rostrum has no central carina.

Hipporrhinus criniger, sp. n.

Long. 16, lat. 6 (♂), 7 (♀) millim.

Head very convex; punctuation on vertex closer but shallow, deeper and more scattered in front; forehead retuse, with a more or less distinct central impression; anteocular furrows deep and complete. *Rostrum* cut off from head by a deep dorsal incision, about as long as prothorax only, stout, strongly curved, sides subparallel to beyond middle, then gently dilated to apex. Upper surface convex, with five strong carinæ, which are generally smooth and shiny; the lateral sulci deep and strong, the lower pair rather shorter, the upper pair alone meeting at base; scrobes straight, oblique but lateral; inferior basal furrow very deep. *Antennæ* with scape just reaching eye; the two basal joints of funicle subequal. *Prothorax* distinctly transverse, the length about equal to the width at base, apex scarcely narrower, sides strongly rounded, broadest a little behind middle, ocular lobes moderately prominent; upper surface almost plane, closely set with round flattened tubercles (devoid of setæ) leaving a narrow central furrow, without a carina; tubercles bare, interstices with dense brown scaling. *Elytra* oblongo-ovate, much narrower in male, shoulders sloping, sides scarcely rounded, broadest at or before middle, apical processes absent in both sexes, the sutural part slightly raised on the declivity in female only. Upper surface slightly convex, striæ with regular rows of shallow punctures separated by small granules, alternate intervals more prominent: intervals 1, 3, 5, and 7 with elongate depressed shiny tubercles, each bearing a very long erect black seta; intervals 2, 4, and 6 with rows of small closely set granules, each bearing a very short depressed pale seta; tubercles and granules bare, interstices with dense brown scaling, more or less variegated with small white patches. *Legs* with close pale pubescence slightly thicker near apex of femora; second joint of posterior tarsi shorter than first, equal to, but narrower than, third.

CAPE COLONY.

I have found examples of this species in the British and Oxford Museums (under the collection name "*petrous*," Buq); and there is a single male in the Stockholm Museum which has been labelled *H. lacunosus*, Gyl., by Mr. Péringuey. Although this insect has a strong superficial resemblance to Gyllenhal's species, an examination of his type (a female) shows it to be quite distinct. In *lacunosus* the intervals are uniform and the granules are subequal throughout, there being no elongate tubercles; moreover there are no long black setæ, but each granule has a very short pale seta, strongly depressed.

Hipporrhinus Gunningi, sp. n.

Long. 19–20, lat. 7½–8 millim.

Head closely punctured and densely squamose, convex on vertex, forehead flattened and with a central carina: eyes rather prominent; anteocular furrows obsolescent. *Rostrum* not incised at base, scarcely as long as prothorax alone, slightly deflected and very little curved. Upper surface with a shallow central furrow throughout containing a narrow shiny carina; lateral sulci well-marked, the upper pair uniting at base, which is not much raised; costæ between sulci obtuse, densely squamose and each with a single row of shiny black granules; scrobes almost straight, lateral but oblique; inferior basal furrow absent. *Antennæ* with scape just reaching eye; the basal joints of funicle subequal. *Prothorax* as long as broad, apex and base of equal width, sides rounded, broadest about middle, a faint transverse impression just behind apex, ocular lobes feebly developed. Upper surface convex, closely set with small granular tubercles leaving a narrow central furrow, without a carina; tubercles black, shiny, each with a depressed seta, interstices with brownish-grey scaling and three narrow paler lines. Elytra elongate, strongly acuminate towards apex in female, scarcely so in male, shoulders sloping, sides rounded, broadest rather behind middle, apical processes absent. Upper surface not very convex, with regular broad shallow striæ containing single rows of small granules; intervals of equal height, with somewhat irregular and often duplicated rows of small closely-set granules; granules black and shiny, each with a depressed seta; scaling dense, fulvous, variegated with small patches of dark brown and grey. *Legs* black, with thin grey pubescence; posterior tarsi with the second joint narrower than first and third, but about as long as the latter.

TRANSVAAL: Leydenburg (teste *Dr. J. W. B. Gunning*).

Through the kindness of Dr. Gunning, I received some years ago a series of six examples of this species from the Pretoria Museum. Its only close ally is *constrictus*, Gyl., which differs, however, in having the prothorax much broader than long, and also in having the dorsal part of the rostrum much more strongly elevated above the level of the forehead. Both these insects may be distinguished from the adjoining species, *arenarius*, Fåhr., and *laticeps*, Mshl., by their large size and the presence of a frontal carina.

Hipporrhinus errans, sp. n.

Long. 12, lat. 6 millim.

Head densely covered with brown squamæ, vertex convex, forehead flattened and with a short central stria; anteocular furrows distinct in their upper half only. *Rostrum* not incised at base, stout, about as long as prothorax only, not much curved. Upper surface almost plane with a distinct carina abbreviated in front, rugosely punctured, with dense scaling and scattered setæ. Lateral sulci distinct, the upper pair rather longer and broader, and meeting at the base, which is a little elevated; scrobes lateral, straight and oblique; inferior basal furrow deep. *Antennæ* with scape just reaching eye; the two basal joints of funicle subequal. *Prothorax* distinctly transverse, apex a little narrower than base, sides strongly rounded, broadest about middle, ocular lobes moderate. Upper surface convex, closely set with small granular tubercles leaving a very narrow and ill-defined central furrow, containing no carina; apices of tubercles black, shiny, each bearing a depressed seta, interstices with dense brown scaling and three narrow whitish lines. *Elytra* short ovate, sides moderately rounded, broadest about middle, shoulders rounded, apical processes very short but acute. Upper surface convex, with regular rows of deep punctures, intervening granules sometimes present, but hidden by the scaling; intervals unevenly costate: intervals 3, 5, and 7 more raised than the others and with regular and complete rows of low granules; interval 1 has a similar complete row, but 2, 4, and 6 are very variable, bearing anything from a complete row to none at all; granules shiny and each with a short depressed seta; scaling dense, variegated brown and grey. *Legs* with sparse pale scaling, which is more dense at the apex of femora; posterior tarsi with the joints of about the same width, second and third subequal, first longer.

NATAL: Estcourt.

In its general facies this insect resembles such species as *arenarius*, Fåhr., and *albicans*, Gyl., from which it may be readily recognized by the uneven elevation of the intervals on the elytra.

Hipporrhinus consors, sp. n.

Long. 11, lat. 5½ millim.

Head with dense brownish scaling, vertex convex, forehead plane and without carina or fovea; anteocular furrows distinct, but not very deep. *Rostrum* not incised at base, shorter than prothorax only, deflected from base, very little curved. Upper surface closely but faintly punctured, densely covered with greyish scaling, with a large tubercle close to base, which is strongly bifid and distinctly dilated at apex; the anterior part without furrows and smooth except for a very faint central carina; both pairs of lateral furrows almost obsolete; scrobes lateral, but oblique and almost straight; inferior basal furrow distinct. *Antennæ* short, thick, squamose; scape just reaching eye; the two basal joints of funicle subequal, not much longer than the others. *Prothorax* transverse, base and apex of equal width, sides strongly rounded, broadest rather before middle, a transverse impression behind apex, ocular lobes well developed. Upper surface convex, fairly closely set with small rounded tubercles, leaving a narrow central furrow without a carina; tubercles black, shiny, with apical punctures, but without setæ; interstices with thick grey scaling. *Elytra* short ovate, shoulders sloping, sides distinctly rounded, broadest about middle, apical processes absent. Upper surface convex, with shallow striæ containing very indistinct punctures separated by small granules; these disappear towards apex and are normally hidden by the scaling; intervals evenly raised with regular and complete rows of small separated granular tubercles, those on intervals 3 and 5 being often more distant. Tubercles rounded, black and shiny, each with a very short depressed seta; interstices variegated with large patches of pale scaling, the most conspicuous of which is a broad transverse patch at the summit of the declivity. *Legs* clothed with pale scaling, which is thicker about apex of femora; posterior tarsi short and broad, the three basal joints subequal.

Transvaal: Leydenburg.

I have received examples of this species from Dr. W. Horn, of Berlin, and from Dr. Gunning, of Pretoria. It may be distinguished from the allied *nasutus*, Fåhr., and *monitor*, Fåhr., by the presence of regular rows of tubercles on intervals 2 and 4 of the elytra, and also by the almost obsolete central carina on the rostrum. The latter character also separates it from *corniculatus*, Fåhr., in which species the rostral tubercle is parallel-sided and not dilated as in *consors*.

Hipporrhinus asper, sp. n.

Long. 11–12, lat. 4½–5 millim.

Head convex, vertex closely and finely punctured and with dense fulvous scaling; forehead bare, dispersely punctured and with a distinct central fovea; anteocular furrows distinct. *Rostrum* not incised at base, about as long as head and prothorax, evenly but not strongly curved throughout. Upper surface with a distinct central furrow, narrow at base and much dilated towards apex, its sides bluntly raised; no central carina; distinctly punctured, except on a narrow smooth central line, punctures bearing depressed setæ; lower lateral sulci almost obsolete, upper ones distinct, convergent, but not meeting at base; scrobes directed to beneath base of rostrum; interior basal furrow shallow. *Antennæ* with scape not reaching eye; the two basal joints of funicle subequal. *Prothorax* broader than long, apex about as wide as base, sides very strongly dilated (owing to several large lateral tubercles), broadest before middle, ocular lobes strongly developed. Upper surface convex, with comparatively large elevated tubercles bearing depressed setæ and leaving a deep central furrow, containing a strong carina; interstices with fulvous scaling. *Elytra* ovate, shoulders roundedly prominent, sides slightly rounded, broadest about middle, apical processes short and blunt. Upper surface convex, with regular rows of foveæ separated by small granules: interval 1 with an indistinct row of granules vanishing behind middle; interval 2 with only three to five prominent tubercles on declivity; interval 3 with a row of seven or eight elevated tubercles terminating abruptly just behind middle; intervals 4 and 6 smooth; intervals 5 and 7 with regular and complete rows of elevated tubercles; scaling sparse, variegated brown and fulvous. *Legs* with scattered scales and a denser pale ring near apex of femora; posterior tarsi with the joints of about the same width, second and third subequal, first longer.

TRANSVAAL: Leydenburg. NATAL.

I have received a single specimen of this species from Dr. Gunning, and there are six others in the British Museum. It is most nearly allied to *caudatus*, Fåhr., but, in addition to its much smaller size, it lacks the long apical processes and has the antecculai furrows converging and distinctly visible from above, whereas they are invisible in *caudatus*.

Hipporrhinus serratus, sp. n.

Long. 11, lat. 5 millim.

Head convex, with dense fulvous scaling on vertex; forehead bare, faintly punctured, and with a rounded central depression; anteocular furrows very deep. *Rostrum* not incised at base, about as long as head and prothorax, stout and slightly curved. Upper surface convex in basal half, almost plane anteriorly, without any central furrow or carina; punctuation deep and setigerous, leaving a narrow smooth central line; lower lateral sulci faint, the upper ones much longer and deeper, meeting at base; scrobes directed to beneath base of rostrum; inferior basal furrow deep. *Antennæ* with scape not quite reaching eye; joints 1 and 2 of funicle subequal. *Prothorax* about as long as broad, base and apex of equal width, sides strongly rounded, broadest rather before middle, ocular lobes well developed. Upper surface convex, with comparatively large, separated, subconical tubercles, leaving a broad central furrow containing a well-developed carina; tubercles bare, shiny, each with a short depressed seta, interstices with fulvous scaling, paler laterally. *Elytra* oblongo-ovate, shoulders roundly prominent, apical processes in female very short and blunt, sides very slightly rounded, broadest just behind shoulders. Upper surface convex, with regular rows of foveæ, occasionally interrupted by faint granules: interval 1 without distinct granules; interval 2 with only a short apical row of four or five sharply conical tubercles; interval 3 with a basal row of rather smaller subconical tubercles terminating about middle; intervals 4 and 6 plane; intervals 5 and 7 with complete rows of sharp conical tubercles; the tubercles, which are of nearly equal size throughout, are bare and shiny, each with a depressed apical seta, the interstices with dark brown scaling variegated with lighter patches. *Legs* with dark scaling and setæ, except for a ring of white scales near apex of femora; posterior tarsi setose, the joints of about the same width, second and third subequal, first rather longer.

TRANSVAAL: Leydenburg.

The only examples I have seen of this species were kindly sent me by Dr. Gunning. It is closely related to *deplorabundus*, Fåhr., but that insect has a continuous central furrow on the rostrum, narrow at the base and broadly excavate in front; the central thoracic carina is also much fainter and concealed beneath the scaling; finally, the row of tubercles on the third interval of the elytra is evenly continuous to the apex.

Hipporrhinus deceptor, sp. n.

Long. 3–15, lat. 6–7 millim.

Head convex, with sparse punctures and squamæ, forehead with a rounded impression, anteocular furrows distinct. *Rostrum* separated from head by a deep dorsal incision, as long as head and prothorax, thick and strongly curved. Upper surface with five strong, smooth, narrow carinæ of even height; lateral sulci deep and distinct, of about equal length, and uniting at base; scrobes lateral, straight and oblique; inferior basal furrow very deep. *Antennæ* piceous, thinly pubescent; scape barely reaching eye; the two basal joints of funicle subequal. *Prothorax* transverse (more distinctly so in female), the length equal to the width at base in female, greater in male, apex rather narrower than base, sides strongly rounded, broadest about the middle, ocular lobes not very prominent. Upper surface rather convex, closely set with small, elevated, granular tubercles, leaving a narrow central furrow without a carina: tubercles bare, shiny, and with very short depressed setæ, interstices with dark scaling and three narrow pale lines. *Elytra* ovate, much narrower in male, shoulders roundly prominent, sides strongly rounded (less so in male), broadest about middle, apical processes very small and contiguous in both sexes. Upper surface convex, distinctly sulcate, sulci with rows of shallow punctures separated by small granules; intervals all evenly raised, subcostate and with regular rows of large shiny granules, each bearing a depressed seta; scaling uneven, with small variegated patches of brown, fulvous, or white. *Legs* piceous, with fine pale pubescence; posterior tarsi with the second joint a trifle narrower than the others, second and third subequal, first longer.

CAPE COLONY: Port Elizabeth (*Dr. H. Brauns*).

Dr. Brauns has kindly sent me a fine series of this new species, apart from which I have seen only a single example, a female, in Chevrolat's collection at Stockholm. It is allied to *lacunosus*, Gyl., which differs in having a much thicker and more strongly curved rostrum, the dorsal surface of which is almost plane and has only a low carina (whereas in *deceptor* it is very deeply sulcate with a strong central carina); again, the first joint of the funicle is distinctly longer than the second (an unusual character in the genus); the prothorax is more narrowed behind and the tubercles are strongly depressed; the elytra of the female *lacunosus* (I have not seen the male) are much more oblong, the suture is prominently raised on the declivity, the sulci are shallower, the granules more depressed and elongate, and the apical processes absent.

Hipporrhinus sparsus, sp. n.

Long. 12, lat. 6 millim. (female).

Head convex, bare, with faint scattered punctures; forehead with a slight central depression; anteocular furrows deep and complete. *Rostrum* cut off from head by a deep dorsal incision, as long as head and prothorax, distinctly curved, very gradually dilated from base to apex. Upper surface nearly plane, with three fine carinæ, the central one the shortest and vanishing beyond middle; no scaling, punctuation indefinite; lateral sulci broad and deep, separated by a strong costa bearing a faint stria, the upper pair only meeting at base; scrobes straight and lateral, almost parallel to the sulci; inferior basal furrow very deep. *Antennæ* piceous; scape just reaching eye; the two basal joints of funicle subequal. *Prothorax* slightly transverse, the length greater than the width at base, which is equal to the apex, sides strongly rounded, broadest about middle, ocular lobes moderately developed. Upper surface slightly convex, closely set with small elevated shiny tubercles with short depressed apical setæ, central furrow very narrow and without carina; interstices with sparse brown scaling. *Elytra* oblongo-ovate, shoulders prominent, the breadth there much greater than base of thorax, sides not much rounded, broadest before middle, apical processes absent in female. Upper surface slightly convex, with shallow closely punctured striæ; intervals with small rather distant tubercles, which are somewhat depressed dorsally and near base, but conical towards sides and apex; intervals 2, 4, and 6 with the tubercles more distant than the rest; interval 1 slight, raised (female) on declivity and with the tubercles there closely set; tubercles with a short apical seta, elytra bare except for a few small scattered patches of yellowish scales. *Legs* black with fine pale scaling; second and third joints of posterior tarsi subequal.

Cape Colony (*Coll. Pascoe*).

A fairly distinct species, coming nearest to *H. deceptor*, Mshl., from which it may be distinguished by the absence of the central furrow on the rostrum and the fine narrow central carina; also by the larger and more distant tubercles on the elytra and the smallness of the prothorax.

Hipporrhinus chirindensis, sp. n.

Long 17, lat. 8 millim.

Head convex, with indistinct punctures and fairly dense brown squamæ; forehead with a distinct central stria; anteocular furrows very deep and strong, approaching one another closely above. *Rostrum* not incised at base, about as long as head and thorax, distinctly curved. Upper surface with a shallow central furrow triangularly dilated to apex and containing a faint central carina; lateral sulci deep, the upper pair convergent at base but not meeting; the interval between the sulci carinate and rugosely punctured; scrobes directed to beneath base of rostrum; inferior basal furrow shallow. *Antennæ* with scape not reaching eye; the two basal joints of funicle subequal. *Prothorax* broader than long, narrower at apex than at base, sides strongly dilated, broadest about middle, ocular lobes moderate. Upper surface almost plane, with a broad transverse impression just behind apex, fairly closely set with small shiny rounded tubercles, each bearing a short depressed seta; central furrow shallow, containing a very short but well-marked carina; interstices with uniform brown scaling. *Elytra* ovate, shoulders sloping, sides moderately rounded, broadest about middle; apical processes in female very short, blunt, and divergent. Upper surface convex, with regular rows of foveæ separated by small shiny granules: interval 1 with a few indistinct granules; 2, 3, 5, and 7 subcostate and with regular rows of granules; on the last three the rows are complete and the granules are larger on the declivity; on interval 2 the granules cease abruptly at the summit of declivity; scaling uniform earth-brown. *Legs* with sparse depressed pale setæ on femora and an ill-defined ring of light scales near apex; tibiæ with mingled light and dark setæ, the former depressed, the latter erect; posterior tarsi spongy beneath, joints of about the same width, second and third subequal, first longer.

MASHONALAND: Mt. Chirinda, Melsetter District.

Very nearly allied to *H. Bohemanii*, Fåhr., but smaller, and distinguished by the absence of granules on intervals 4 and 6 of the elytra, the presence of a central furrow and carina on the rostrum, and the long stria on the forehead.

Hipporrhinus brevis, sp. n.

Long. 10, lat. 5 millim. (female).

Head convex on vortex, which is closely and distinctly punctured; forehead flattened, with fine convergent plications and a short low central carina near the rostrum bearing a single fovea; anteocular furrows obsolete. *Rostrum* not incised at base, short and thick, as long as thorax only, deflected and slightly curved. Upper surface with a stout basal tubercle which has its sides rather convergent and its apex sharply bifurcated; anterior part almost plane, rugosely punctured and with a very faint short carina; lateral sulci broad and distinct, uniting at base; scrobes lateral and curved; inferior basal furrow very deep. *Antennæ* with scape reaching to about middle of eye; the two basal joints of funicle subequal. *Prothorax* transverse, the length equal to the width at base, which is as broad as apex, ocular lobes distinct. Upper surface convex, closely set with low granules, each bearing a pale depressed seta; scaling brown, with three narrow and indistinct paler lines. *Elytra* very short, ovate, sides strongly rounded, broadest before middle, acuminate behind (female), shoulders rounded, apical processes absent. Upper surface rather convex, striæ with rows of shallow, subreticulate foveæ, intervals evenly raised and with large, very depressed, shiny, distant granules, which bear depressed pale setæ; scaling not very dense, yellowish brown. *Legs* with scattered pale scaling, forming a denser ring at apex of femora; posterior tarsi with the three basal joints of about the same width, second and third subequal, first longer.

CAPE COLONY.

The nearly allied *talpa*, Fåhr., and *vicinus*, Mshl., differ in the absence of plication on the forehead, in the finer punctuation of the striæ, and in the smaller and much more numerous granules (and therefore setæ) on the elytra.

Hipporrhinus Braunsi, sp. n.

Long. 11, lat. 5 millim.

Head convex on vertex, forehead flattened and with a deep impression on each side; punctuation close and regular, but mostly hidden by fulvous scaling; anteocular furrows deep, convergent above and only separated by a narrow costa. *Rostrum* not incised at base, nearly as long as head and prothorax, deflected and slightly curved. Upper surface with a broad and distinct central furrow throughout, containing no carina, but with its edges carinate and bearing a regular row of depressed pale setæ; punctuation hidden by uniform dense brown scaling; lateral sulci broad and deep, subequal, the upper pair alone meeting at base, which is much raised above the level of forehead; scrobes directed to beneath base of rostrum; inferior basal furrow deep. *Antennæ* with scape not reaching eye; joints 1 and 2 of funicle subequal. *Prothorax* a trifle broader than long, apex and base of equal width, sides strongly rounded, broadest before middle, ocular lobes well developed. Upper surface convex, with small rounded widely separated tubercles leaving a broad but shallow central furrow containing a distinct carina; tubercles black and shiny, with a depressed pale apical seta; interstices with dense brown squamosity. *Elytra* ovate, shoulders rounded, sides very little dilated, broadest before middle, apical processes (in female only) very small, tuberculiform, and contiguous. Upper surface convex, with regular rows of large reticulate foveæ without intervening granules: interval 1 without granules but with a single row of depressed setæ; interval 2 with only a short apical row of three or four very small tubercles, that at the summit of declivity much larger than the rest; interval 3 with a costa to beyond middle and continued to apex in the form of small separate tubercles, the largest being at the top of the declivity (in a varietal form this costa is replaced by a row of small separated tubercles); intervals 4 and 6 smooth or with a few isolated tubercles; 5 and 7 with complete rows of small conical remote tubercles;

scaling dense, uniform brown; tubercles bare at apex, each with a thick whitish depressed seta. *Legs* thin, densely covered with brown scaling and with scattered white setæ; posterior tarsi narrow, the three basal joints of equal width, second and third equal, first rather longer.

ORANGE COLONY: Bothaville (*Dr. H. Brauns*).

I owe all my examples of this species to the kindness of my friend Dr. Brauns. The only insect with which it can be confused is *quadrinodis*, Fåhr., in which, however, the costa on interval 3 of the elytra terminates abruptly at the declivity, without any apical tubercles, and interval 7 is simply carinate and not tuberculate.

Hipporrhinus vicinus, sp. n.

Long. 10, lat. 5 millim.

Head densely covered with brown scaling, convex, forehead without fovea or carina; anteocular furrows absent. *Rostrum* not incised at base, short and thick, shorter than the prothorax alone, deflected but scarcely curved, a little more slender in male than in female. Upper surface with a stout basal tubercle which has its sides subparallel and its apex sharply bifurcated; anterior portion almost plane, rugosely punctured, and with a faint carina running from the middle back to the apex of tubercle; lateral sulci indistinct, the upper pair uniting at base; scrobes shallow, lateral, and oblique; inferior basal furrow very deep. *Antennæ* with scape reaching to about middle of eye; joints 1 and 2 of funicle subequal. *Prothorax* rather transverse, apex about as wide as base, sides strongly rounded, broadest about middle, ocular lobes very slight. Upper surface convex, closely set with setigerous granules, central furrow almost obsolete; granules black and shiny, interstices with brown scaling, except for three pale longitudinal lines. *Elytra* short ovate, broadest before middle, shoulders sloping, apex bluntly rounded in male, subacuminate in female, apical processes absent. Upper surface distinctly sulcate, sulci with rows of ocellated punctures, without intervening granules, and often hidden by the scaling; intervals finely carinate, especially 3, 5, and 7, which are rather higher than the others; intervals 1 and 2 with no granules but with regular rows of recumbent setæ; the other intervals have rows of minute setigerous granules which disappear near apex and are there replaced by depressed setæ; scaling dense, variegated brown and grey, granules black and shiny. *Legs* with thin pale scaling and without a femoral ring; posterior tarsi broad, first joint longer than second or third which are subequal, but the latter slightly broader.

NATAL: Estcourt.

I found this species fairly common near Estcourt, where it seems to replace the nearly allied *talpa*, Fåhr., which differs in having the intervals on the elytra less raised and of even height, and in having a fovea on the forehead. Prof. Aurivillius first drew my attention to the specific distinction of *vicinus*, and kindly gave me one of the original examples of *talpa* captured by Wahlberg.

Hipporrhinus laticeps, sp. n.

Long. 10, lat. 4 millim.

Head densely covered with brown scaling, convex on vertex, forehead broad, flattened and with a short central carina; eyes prominent; anteocular furrows short and narrow, but distinct. *Rostrum* not incised at base, short and thick, about as long as prothorax only, scarcely curved. Upper surface convex, with five thin undulating carinæ, which are black and shiny, the three central ones being of the same height; the intervals closely punctured and clothed with dense brown squamæ: lateral sulci distinct, the upper pair much broader and converging at base, which is evidently raised; scrobes lateral, but oblique; inferior transverse basal furrow absent. *Antennæ* piceous, finely pubescent; scape just reaching anterior margin of eye; the two basal joints of funicle subequal. *Prothorax* transverse, its length about equal to the width at base, which is scarcely broader than apex, anterior margin deeply sinuate, sides moderately rounded, broadest about middle, ocular lobes very slight. Upper surface convex, closely set with rounded granules, leaving a narrow central furrow without any carina; granules bare, shiny, each with a subdepressed seta; interstices with brown scaling and a paler central line. *Elytra* elongato-ovate, rather acuminate apically in female, shoulders not sloping but rounded, sides scarcely ampliated, broadest about middle, apical processes absent. Upper surface almost plane on disk, faintly sulcate, the sulci containing small shallow punctures which are quite hidden by the scaling; all intervals similar, having single rows of minute black granules bearing subdepressed setæ; scaling dense, uniform grey-brown. *Legs* with long whitish pubescence; posterior tarsi narrow, setose, joint 2 rather narrower than 1 and 3, distinctly shorter than 1, but about equal to 3.

CAPE COLONY: Port Elizabeth (*Dr. H. Brauns*).

This species is most nearly related to *arenarius*, Fåhr., and *setiferus*, Gyl. The former differs in having the base of the rostrum more strongly raised and the inferior basal furrow is present; the prothorax has its sides strongly rounded and the apex is much narrower than the base; the elytra are much broader, with the shoulders sloping, the sides strongly rounded, and the punctures and intervening granules in the sulci clearly visible through the scaling. Gyllenhal's species has a much narrower, rather longer, and more curved rostrum, on which the inner pair of carinæ is parallel and not convergent towards base; the prothorax is much less transverse, the anterior dorsal margin is truncate, and the ocular lobes strongly developed; the elytra are of much the same shape, but broader, the sulci are granulate and the granules on the intervals are much more numerous, more prominent, and less regular.

Hipporrhinus incertus, sp. n.

Long. 10, lat. 4½ millim.

Head with dense brown scaling, vertex convex and closely punctured, forehead strongly depressed, indistinctly punctured and without fovea or carina; anteocular furrows obsolete. *Rostrum* not incised at base, short and thick, about as long as prothorax only, deflected and scarcely curved. Upper surface with a stout basal tubercle, which has its sides subparallel and its apex sharply bifid; anterior part slightly excavated, closely punctured and with a narrow but distinct central carina, which ascends the tubercle; lateral sulci meeting at base, the upper pair broad and shallow, the lower narrower and deeper; scrobes lateral, oblique and curved; inferior transverse furrow broad and deep. *Antennæ* with scape reaching the posterior margin of eye; the second joint of funicle rather longer than first. *Prothorax* transverse, its length equal to the width of both base and apex, sides rounded, broadest about middle, ocular lobes very little developed. Upper surface convex, fairly closely set with small separated conical tubercles, arranged in more or less irregular longitudinal rows, and leaving a narrow central furrow without any carina; tubercles black, shiny, and each with a depressed seta; interstices with uniform brown scaling. *Elytra* ovate, shoulders sloping, broadest before middle, female more acuminate apically than male, apical processes absent. Upper surface convex, with faint striæ containing rows of indistinct punctures, sometimes separated by minute granules: intervals 1, 3, 5, and 7 with regular and complete rows of granules;

intervals 2, 4, and 6 without any, or at most a few isolated, granules; granules black, shiny, each with a depressed seta; scaling thin, uniform brown. *Legs* black, with sparse brownish-grey scaling and a paler ring near apex of femora; posterior tarsi with joints 2 and 3 subequal.

MASHONALAND: Salisbury and Marandella's.

From its nearest allies, *talpa*, Fåhr., and *vicinus*, Mshl., this species may be recognized by the sparser and more elevated granules on the prothorax, the almost entire absence of granules on intervals 2, 4, and 6 of the elytra, and the much larger and more distant granules on the remaining intervals. From other small species having a rostral tubercle, such as *corniculatus*, *nasutus*, and *armatus*, Fåhr., it may best be distinguished by the fact that the scape extends well beyond the anterior margin of the eye.

Hipporrhinus aculeatus, sp. n.

Long. 12, lat. 5 millim.

Head broadly and deeply excavated; densely clothed with brown scaling, with the vertex, a narrow central line, and a ring round the eye paler and with a metallic reflexion; a short fine central stria between the eyes; anteocular furrows narrow but deep, approximated dorsally. *Rostrum* not incised at base, as long as head and thorax, deflected and slightly curved, its upper outline very strongly angulated beyond middle. Upper surface convex, densely covered with pale scaling, 5-sulcate, the carinæ edging the central furrow being gradually raised so as to form a sharp angular prominence beyond middle. Lateral sulci deep and distinct, the upper pair meeting at base; scrobes straight and directed beneath base of rostrum; basal transverse furrow beneath present, but not strongly marked. Prothorax as long as its width at base, very little narrower at apex, sides not much rounded, broadest about middle, ocular lobes moderately developed. Upper surface not very convex, with a broad median furrow (without a carina) and three regular rows of long, cylindrical, spine-like tubercles, each row containing five. The whole surface densely clothed with brown scales, except the extreme apices of the tubercles, each of which bears a long depressed seta. *Elytra* elongato-ovate, sides not much rounded, broadest about middle, apical declivity longer and more abrupt than usual, no apical processes. Upper surface very convex, with regular rows of punctures (somewhat obscured by the dense brownish scaling); the intervals slightly and equally costate, each with a regular row of small, scale-covered, setigerous granules, those on interval 2 slightly cristate on the declivity only. *Legs* elongate, with dense grey scaling and scattered pale setæ; posterior tarsi with the second joint a little narrower than the others, second and third subequal, first slightly longer. *Antennæ* with scape barely reaching eye; the two basal joints of funicle subequal.

CAPE COLONY: Grahamstown (*coll. Pascoe*).

This species is closely allied to the aberrant *H. thoracicus*, Fåhr., from which it is distinguished among other points by the dorsal angulation of the rostrum, the more deeply excavate head, the more declivous and less strongly costate elytra, and the shorter tarsi; but the most interesting distinction lies in the direction of the scrobe, which is purely lateral in *thoracicus*, but directed beneath the base of the rostrum in *aculeatus*.

Hipporrhinus bimaculatus, sp. n.

Long. 10·5–12, lat. 4·5–5·5 millim.

Head convex, closely and distinctly punctured, and with thin yellowish scaling; forehead with a small, bare, smooth spot near base of rostrum; anteocular furrows absent. *Rostrum* not incised at base, as long as prothorax only, scarcely curved. Upper surface convex, with a fine, smooth, central carina and two, much less distinct, on either side; the upper pair of lateral sulci meeting at base, where the central part of the rostrum is sharply raised, so as to form a rudimentary basal tubercle; the scrobes are shallow, entirely lateral, and oblique; no transverse basal furrow beneath. *Antennæ* rather longer in the male, black, with grey pubescence; scape reaching the posterior margin of eye; the two basal joints of funicle subequal. *Prothorax* in the male a little broader than long, the length being equal to the width of both base and apex; in the female distinctly transverse, the length being shorter than the width of base or apex; sides strongly rounded, broadest about middle, ocular lobes almost obsolete. Upper surface convex, closely set with low granular tubercles, each bearing a depressed seta, and leaving a very narrow central furrow, without any carina. Scaling brown, with three narrow white lines, one central, the others lateral. *Elytra* ovate and acuminate in female, ellipsoidal and narrower in male, jointly rounded at apex, shoulders sloping, sides rounded, broadest rather before middle. Upper surface convex, with shallow striæ containing regular rows of small punctures; intervals all equally raised, each bearing a single row of shiny setigerous granules, which are largest near base and rapidly diminish in size towards apex. Scaling dense, variegated brown and grey, with a small but conspicuous white spot at the declivity on the third interval. *Legs* with fine grey pubescence; intermediate tibiæ curved internally just before apex, but much more markedly so in the male; this sex also has the posterior tibiæ very strongly compressed laterally just before apex; posterior tarsi with the second joint a trifle narrower than the others, second and third subequal, first joint very long and broad in male, longer than second and third together, but normal in female.

MASHONALAND: Salisbury.

A plentiful species about Salisbury, usually feeding on a common herbaceous plant (*Pseudarthria* sp.). It is nearly allied to *varius*, Fåhr., but that species has no trace of a rostral tubercle, the elytra are more acuminate in both sexes, and the granules are obsolescent on the disk; the intermediate tibiæ are not nearly so incurved; and the male has the posterior tibiæ and tarsi normal. The compression of the posterior tibiæ in *bimaculatus* distinguishes it from every other species in the genus known to me.

LXI.—*On a Collection of Snakes from North-western Argentine and Bolivia containing new Species.* By Dr. EINAR LÖNNBERG.

BARON ERLAND NORDENSKIÖLD, having returned this summer from an expedition to the Bolivian Chaco and North-western Argentine, has delivered to me for determination a collection of snakes containing sixteen species, two of which seem to be new and which I venture to describe in the following pages; but as the region visited is very little known zoologically except through the collections brought home to Europe by Dr. Borelli*, I append the full list of species of this collection.

The places where Baron E. Nordenskiöld and his companions made the principal collections were the following:—

Quinta, S. Barbara, near Laguna de la Brea, Province de Jujuy, North-western Argentine: luxuriant subtropical forests.

Moreno, Puna de Jujuy, Argentine, 3500 m. above the sea-level: stony desert, with a sparse vegetation of shrubs.

---

* *Conf.* Peracca, Boll. Mus. Zool. Anat. Comp. Torino, 1897, vol. xii. no. 247.

Fortin Crevaux, Bolivian Chaco near Pilcomayó: dry woods with spiny Mimosaceæ &c.

Tatarenda, Caiza, Bolivian Chaco: on the border between the dry woods and the subtropical forest, partly broken up in groves separated by grassy areas.

Drymobius bifossatus, Raddi.

Four specimens from Tatarenda, Bolivian Chaco.

Leptophis rostralis, sp. n.

A young specimen of this genus seems to represent a hitherto unknown species, and I name it therefore, at least provisionally. It does not agree with any of the descriptions in the literature, but might perhaps turn out to be the young stage of some other species, although that, too, does not seem probable.

The loreal is absent, the obliquely disposed scales are smooth and arranged in fifteen rows. The ventrals are distinctly angulate laterally. The rostral is broadly visible from above. Already the combination of these characteristics seems to suffice to distinguish it from the hitherto known species of *Leptophis*, but a full description will make the distinction still more plain.

Head moderately elongate, a little more than twice as long as broad. Eye rather large, its length equalling its distance from the nostril. Rostral broader than deep, the portion visible from above almost equalling two thirds the length of the internasals. Internasals much shorter than præfrontals, about equalling two thirds the length of the latter. Frontal about once and a half as long as broad, longer than its distance from the snout, but shorter than the parietals. Nasal elongate, semidivided. No loreal; præfrontal in contact with second and third labials. One præocular, not reaching the frontal; two postoculars. Temporals 1+1. Eight upper labials, fourth and fifth entering the eye. Five lower labials in contact with the anterior chin-shields, which are a little shorter than the posterior. Scales in 15 rows, all smooth, although in the posterior part of the body a faint trace of a keel may be discerned on some scales of the median and adjoining rows, more seldom on others. Ventrals distinctly angulate laterally, 167 in number. Anal divided; subcaudals 148. General colour bronzy above, because the scales are densely mottled with bronzy or golden, so that the bluish (green) ground-colour is not conspicuous unless under a magnifying-glass, and then mostly at the anterior part of the body a series of oblique dark stripes are seen running from the back and sloping down the sides in a backward direction. These stripes are regularly arranged and are formed in such a manner that the tip and more or less of the upper part of every third scale is blackish. Posteriorly the body and the tail are uniformly bronzy. The upper head-shield bluish, mottled with bronzy and black-edged. Upper labials and lower parts, including the outer row of scales, whitish, but posteriorly and under the tail the colour becomes more greyish.

The only specimen was collected at San Miguel. It measures 36 centim.

Liophis pœcilogyrus, Wied.

Six (mostly young) specimens from Tatarenda, Bolivian Chaco.

Xenodon Merremii (Wagler), Blgr.

Several specimens from Tatarenda.

The largest specimen measured 94 centim. This and three others had the usual spotted appearance. A fifth specimen, measuring 82½ centim. in length, does not show any markings at all, being uniformly light brown above and dirty yellowish beneath. The next smallest specimen, measuring 63 centim. in length, has the markings very well developed and shows a remarkable likeness in pattern and mimicry to *Lachesis Neuwiedi*, which lives in the same region. The youngest specimen, measuring about 31½ centim., has the cross-bands constricted in the middle only in the anterior part of the body. The small spots of the lateral series become on the posterior part of the body and the tail confluent into a dark stripe.

Lystrophis semicinctus, Dum. & Bibr.

Three specimens from Crevaux, near Pilcomayo, Bolivian Chaco, and others were observed at different places.

Rhadinæa sagittifera (Jan).

Numerous specimens from Tatarenda and Crevaux, Bolivian Chaco.

The specimens agree as regards their coloration with Peracca's * description, the large individuals having the back quite or almost unspotted; but the young ones have numerous more or less confluent spots on the back and along the sides &c., as the author quoted states. On some specimens there are quite fine minium-red stripes between the scales, which stripes on the tail become broader and encroach more on the scales, so that the tail appears almost brick-red towards the end.

---

* Boll. Mus. Zool. Anat. Comp. Univ. Torino, vol. xii. (1897).

Rhadinæa occipitalis, Jan.

A small specimen from Tatarenda.

Oxyrhopus rhombifer, Dum. & Bibr.

A beautiful specimen from Quinta, Province de Jujuy, Argentine. It is not recorded in Berg's "Fauna Erpetologica Argentina" (An. Mus. Nac. de Buenos Aires, t. vi. 1898).

This snake, as well as *Lystrophis semicinctus*, may be said to strikingly mimic *Elaps* in their coloration.

Oxyrhopus clœlia (Daudin).

A large black specimen (160 centim.) from Tatarenda, Bolivian Chaco.

Tachymenis peruviana, Wiegm.

Two specimens of this snake were collected near Moreno, Puna de Jujuy, Argentine, 3500 m. above the sea-level.

Philodryas Erlandi *, sp. n.

Eye a little longer than half its distance from the end of the snout (in the young its length equals its distance from the nostril). Snout a little prominent and obliquely truncate. Rostral much broader than high, just a little visible from above. Internasals shorter than præfrontals. Frontal not quite once and a half as long as broad, a little longer than its distance from the snout, not quite as long as the parietals (almost as long in the young). Loreal longer than deep. One præocular, not reaching the frontal. Two postoculars. Temporals 1+2. Eight upper labials, fourth and fifth entering the eye. Five (four in the young) lower labials in contact with the anterior chin-shields, which are of equal size with the posterior ones. Scales smooth (with single apical pits), in 19 rows. Ventrals only very obtusely angulate, 230–236; anal divided; subcaudals 140–150. Bluish green anteriorly

---

* I take the liberty of dedicating this species to my friend Baron Erland Nordenskiold.

(in spirit), becoming light greyish brown towards the posterior half of the body; tail paler, being in the older specimen light brownish grey, in the younger more reddish, almost dull brick-red. The younger specimen is also more brownish or olive on top of the head and neck, so that the bluish-green colour is most prominent on the sides of the neck and body, where the scales have that colour, but are edged with light brownish. A blackish stripe extends from the nostril, through the lower part of the eye along the upper margin of the upper labials, which otherwise are whitish. This dark stripe disappears on the neck. Below greenish blue anteriorly, becoming more greyish (or reddish in the younger one) posteriorly; a whitish band occupies the lateral ends of the ventrals and the lower half of the outer row of scales. This band is conspicuous to the anus, where it disappears. The tail has about the same coloration below as above, only lighter below.

The larger specimen from Crevaux, Bolivian Chaco, measures 74½ centim. in total length, the tail is 23½ centim. The smaller specimen is from Tatarenda *.

Elaps frontalis, Dum. & Bibr.

I refer to this species a rather large specimen from Tatarenda measuring about 124 centim. It has eight sets of black annuli; upper head-shields black, edged with yellow; only three lower labials in contact with the anterior chinshields; tail ending very obtusely. With these characteristic features it combines, however, a rather large number of shields, namely, ventrals 246 and subcaudals 28. I think, however, that this does not prevent the identification from being correct, because the variability of the species seems to be rather large with regard to the number of shields.

Leptognathus Mikani (Schleg.).

One specimen from the Bolivian Chaco.

Leptognathus turgida, Cope.

Three specimens from Tatarenda, Bolivian Chaco.

Lachesis Neuwiedi, Wagler.

Three specimens from Quinta, Province de Jujuy, Argentine, and six from Tatarenda, Bolivian Chaco.

It is known under the name of "Vibora."

---

* I have had the pleasure of consulting Mr. G. A. Boulenger concerning this new species, and beg therefore to offer him my thanks for his kindness.

Crotalus terrificus (Laur.).

A specimen without any distinct markings on the neck. It resembles thus, in this respect, the more northern form. The specimen recorded by Boulenger in Cat. Snakes Brit. Mus. from Bolivia had the "stripes on the neck well-marked" (*l. c* p. 575). It is not recorded by Peracca from Borelli's collection (*l. c.*) nor by Boulenger* from Boggiani's collections in the northern Chaco. Dr. Rob. Fries, the botanist of the Swedish expedition, told me about the death of two Bolivians caused by the bite of the "cascavella."

LXII.—*Some Recent Additions to and Notes on the Crustacean Fauna of New Zealand.* By GEORGE M. THOMSON, F.L.S.

IN view of the proposed publication of the 'Index Faunæ Novæ-Zealandiæ' under the editorship of Captain F. W. Hutton, it is desirable to record the occurrence of any species which have recently been identified as occurring in these islands, and which have already been described elsewhere. The following species of Crustacea have hitherto not been recorded from New Zealand.

BRACHYURA.

Family **Macrophthalmidæ.**

Genus MACROPHTHALMUS, Latr.

Macrophthalmus hirtipes.

Cleistostoma? hirtipes, Jacquinot et Lucas, Voy. au Pôle Sud, vol. iii. p. 68, pl. vi. figs. 8 & C.

This crab, originally described from Samoa, has hitherto been confused with *Hemiplax hirtipes*, Heller, a species from which it is quite distinct. It occurs commonly in Otago Harbour, Akaroa, and Port Cooper, and is usually found between tide-marks.

Family **Leucosiidæ.**

Genus EBALIA, Leach.

Ebalia tuberculosa, A. Milne-Edwards.

Ebalia tuberculosa, A. Milne-Edwards, 'Challenger' Brachyura, p. 306, pl. xxv. fig. 1.

---

* Ann. Mus. Civico Genova, s. 2, vol. xix. (1898).

This species was hitherto only recorded from New Zealand in the Report of the 'Challenger,' numerous specimens having been taken at Station 167, about 150 miles west of New Plymouth, in 150 fathoms. I have recently received several specimens collected by Mr. R. Henry in over 40 fathoms, in Dusky Sound.

AMPHIPODA.

Family **Lysianassidæ.**

Genus AMARYLLIS, Haswell.

Amaryllis macrophthalmus, Haswell.

Amaryllis macrophthalmus, Haswell, Cat. Australian Crust. p. 227.

I have identified specimens from Moko-Hinau taken by Mr. Sandager; and from Lyttelton, where one was collected by Dr. Chilton.

Family **Phoxocephalidæ.**

Genus PHOXOCEPHALUS, Stebbing.

Phoxocephalus bassi, Stebbing.

Phoxocephalus bassi, Stebbing, 'Challenger' Amphipoda, p. 811, pl. liv.

This species is described from a single specimen taken on the surface in Bass Straits. I have the same species among surface-net collections taken in Otago Harbour by Dr. Chilton.

Family **Eusiridæ.**

Genus LILJEBORGIA, Spence Bate.

Liljeborgia Haswelli, Stebbing.

Liljeborgia Haswelli, Stebbing, 'Challenger' Amphipoda, p. 985, pl. xcii.

A single specimen was collected by me in the Bay of Islands many years ago; but recently, in trawling off Otago Heads and in Tasman Bay, the species has been commonly met with living in pairs in the upper whorls of shells occupied by hermit-crabs. In the southern locality it was always associated with *Eupagurus novæ-zealandiæ*, Dana, but in Tasman Bay with *E. rubricatus*, Henderson. It is a strikingly coloured species, the anterior half of the body being bright pink or red and the posterior white.

Genus EUSIRUS, Kröyer.

Eusirus longipes, Boeck.

Eusirus longipes, Boeck, 'Challenger' Amphipoda, p. 965, pl. lxxxvii.
Eusirus cuspidatus, Kroyer, var. *antarcticus*, mihi.

The species was originally wrongly identified by me. There is no doubt it is the same as the northern species. The solitary 'Challenger' specimen was collected at Kerguelen.

Family **Ampeliscidæ.**

Genus AMPELISCA, Kröyer.

Ampelisca acinaces, Stebbing.

Ampelisca acinaces, Stebbing, 'Challenger' Amphipoda, p. 1030, pls. ci. & cii.

Stebbing's description was drawn up from a solitary female specimen obtained in Port Jackson at a depth of 35 fathoms.

The species is not unfrequently found washed up on the ocean beach, Dunedin, often in considerable numbers. It is probably therefore a pelagic form.

Family **Photidæ.**

Genus AUTONOE, Bruzelius.

Autonoe kergueleni, Stebbing.

Autonoe kergueleni, Stebbing, 'Challenger' Amphipoda, p. 1087, pl. cxi.

Several male specimens of this species were collected by me in the Bay of Islands. The species was originally described and figured by Stebbing from a single specimen taken off Cumberland Bay, Kerguelen, in 127 fathoms.

Family **Phliadidæ.**

Genus IPHINOTUS, Stebbing.

Iphinotus typica, Thomson.

Iphigenia typica, Thomson, Trans. N. Z. Inst. vol. xlv. p. 237.
Iphinotus Chiltoni, Stebbing, Trans. Linn. Soc., Zool. vol. vii. p. 419, pl. xxxv. B.

The name *Iphigenia* having been preoccupied, Stebbing suggested the new genus *Iphinotus* to receive a species resembling *I. typica*, which he named *Iphinotus Chiltoni*. But a re-examination of my original species shows that I wrongly described certain features, and convinces me of the identity of the two species. The name therefore must stand as above. The species has been found only rarely in Otago Harbour.

Order COPEPODA.

Family **Calanidæ.**

Genus GUERNEA, Thomson.

In 1895 I described and figured a new Copepod from Macquarie Island as *Guernea antarctica.* In accordance with a suggestion received from my friend Rev. T. R. R. Stebbing, I propose the name *Deguernea* for the new genus, as the former is already preoccupied.

LXIII.—*Some* Coccidæ *from Mexico.*

By T. D. A. COCKERELL.

THE Coccidæ herein discussed were all collected in the summer of 1902 by Professor C. H. Tyler Townsend, to whom we have also in former years been greatly indebted for additions to the Coccid fauna of Mexico *.

Erium zapotlanum, sp. n.

♀.—Gregarious on the leaves, in loose globular snow-white sacs, about 3 millim. diam., which adhere to anything they touch. Boiled in KHO, turns crimson, but only slightly stains the liquid; ♀ cleared and mounted about 1800 μ long and 1000 broad. Anal ring with six bristles; dorsal surface with small spines (about 18 μ long) in rows, far apart; sides with many minute glands; ventral surface with fewer but larger circular glands and a very few bristles; labium dimerous, about 100 μ long and 81 broad; legs and antennæ pale, no denticle on inner side of claw; antennæ 7-jointed. Measurements of legs and antennæ in μ:—Femur + trochanter 186; tibia 150; tarsus 69; claw 27. Antennal joints: (1) 30, (2) 30, (3) 33, (4) 27, (5) 25, (6) 27, (7) 66.

Hab. Zapotlan, July 7, on "Huele de Noche."

Allied to *Erium eriogoni* (*Dactylopius eriogoni*, Ehrhorn) from California, but the female is of a different colour, and there are other differences obvious upon close comparison. I am not quite sure that we do well to accept the genus *Erium* as distinct from *Dactylopius* (i. e. *Pseudococcus*, Westw.); if it is accepted it would seem that it ought to include also *Irishi*, *Steelii*, *lichtensioides*, and *neomexicanus*. It is easy enough to group together these species which have a complete sac, but there remains a doubt whether they are as intimately related as their superficial appearance would suggest. *E. Steelii* (Ckll. & Towns.) was found by Townsend on May 3 at Ojo de San Diguela in Chihuahua. Its antennal joints measured thus: (1) 12–45, (2) 40–45, (3) 36–42, (4) 21–27, (5) 24–33, (6) 27, (7) 36–40, (8) 84–87.

---

* Including the species now reported, 161 Coccidæ are known from Mexico. Of these, 96 have proved new to science, their discoverers being, so far as known, as follows:—Townsend, 51; Koebele, 26; Dugès, 6; Cockerell, 3; Sallé, 2; Llave, Herrera, Palmer, 1 each.

Takahashia jaliscensis, T. D. A. & W. P. Ckll., sp. n.

♀.—Ovisac pale yellowish, firm, standing straight out from branch, about 13 millim. long and 6 broad, with the shrivelled female on the end. Female after boiling dark brown (nearly clear after prolonged boiling), circular, about 6 millim. diam.; margin with sharp spines as in *Lichtensia*, about 30 μ long and as far apart as the length of one; skin with numerous minute glands; anal plates ordinary, but quite broad, about 240 μ long; legs strongly coloured; femur + trochanter 315 μ, tibia 219, tarsus 132; claw about 45 μ long, very large and very stout at base; tarsal digitules extremely fine, about 75 μ long, with minute knobs; claw-digitules extending far beyond claw, as far as tarsal digitules, very slender, with small knobs; antennæ short, more or less rudimentary, 5- to 7-jointed, length 210 μ or more; in the 5-jointed form the last four joints measure in μ: (2) 30, (3) 54, (4) 90, (5) 60; in the 6-jointed 4 is divided, and we have (4) 42, (5) 30, (6) 60; in the 7-jointed 6 is divided.

Embryonic larva with 6-jointed antennæ, the joints measuring in μ: (1) ?, (2) 30, (3) 24, (4) 24, (5) 36, (6) 51. The young are ochreous, with two broad longitudinal black stripes; the cephalic end is abruptly narrowed, and the black stripes are replaced by mere lines; eyes black and conspicuous.

Hab. Barranca de Atenquique, Jalisco, July 9, on "Copal." The leaves of the plant are pinnate, with about eleven to twelve pairs of leaflets. The plant is, perhaps, a *Rhus*, as suggested by Townsend.

The discovery of *Takahashia* in Mexico is very surprising; the genus has hitherto been represented by a single species found in Japan. A new study of the genus shows that it is derived from *Lichtensia*, not from *Pulvinaria*, as formerly supposed. *Exæretopus* is also related to *Lichtensia*.

Lichtensia colimensis, sp. n.

♀.—Ovisac white. Skin with numerous large colourless oval pits, 15–21 μ long; spiracles large, the outer ring about 75 μ diameter; margin with numerous sharp spines, as in the other American members of the genus; anal plates ordinary, about 165 μ long; legs and antennæ light brown; claw-digitules with large knobs, extending considerably beyond claw; tarsal digitules as in *L. crescentiæ*; hind tarsus with a constriction; antennæ 8-jointed. Measurements of legs and antennæ in μ:—Anterior leg—femur + trochanter 195, tibia 135, tarsus 63; hind leg—femur + trochanter 213, tibia 135, tarsus 75–81. Antennal joints: (1) 30, (2) 36–45, (3) 66–72, (4) 37–45, (5) 36–42, (6) 33–35, (7) 30, (8) 39–45.

Hab. Colima, July 12; on *Celtis* (?).

The antennæ are as in *L. lycii*, except that joint 2 is longer; the tibia and tarsus are too small for *L. crescentiæ* or *mimosæ*, but agree pretty well with *lycii*. The constriction of the anterior tarsus is a little before the middle in *lycii*; in *colimensis* a similar constriction exists, but a little beyond the middle.

Lichtensia zapotlana, sp. n.

♀.—Ovisac long, pure white, narrow, firm, not adhering to objects; length 6, breadth 2 millim. ♀ covered with an easily deciduous glassy secretion; the insect is very dark brown and very hard to clear, remaining dark after prolonged boiling in KHO. Anal plates ordinary; marginal spines sharp, about 30 μ long, and as far apart as the length of one; anterior leg with femur + trochanter 330, tibia 204, tarsus 100 μ; antennæ 8-jointed, (1) 45, (2) 33–35, (3) 111–114, (4) 69–81, (5) 60–66, (6) 39–40, (7) 30–32, (8) 45–51.

♂.—Scale glassy, roughish, with a subreticulate appearance, dorsal area (between the longitudinal lines) about equal to either lateral area. ♂ reddish, marked with black; costa with a greyish-red stripe.

Hab. Zapotlan, July 7, on a leguminous shrub.

Seems near to *L. argentata*, Hempel. *Pulvinaria parvula*, Ckll., is also allied, and should stand as *Lichtensia parvula*: it is a smaller insect than *zapotlana*, but has even larger legs. It appears that in tropical Mexico (and possibly in the whole Neotropical region) *Lichtensia* takes the place of *Pulvinaria*, the species of the latter genus found there being introductions from elsewhere. There are genuine species of *Pulvinaria* at present found only in the West Indies and Brazil, but it is not impossible that they came from other regions where they have not yet been observed.

Lichtensia lutea (Ckll.).

San Geronimo, Colima, Aug. 1, on "Orteguilla," *Ficus* sp.

Toumeyella mirabilis (Ckll.).

Cerro, Chilicote, Chihuahua, April 29, on *Prosopis*.

Tachardia larreæ (Comst.).

Plain at west base of Cerro Chilicote, Chihuahua, April 25, on *Larrea*.

Prosopophora manihotis, Townsend.

Zapotlan, Jalisco, July 6, on *Mimosa* sp., and July 7 on *Leucæna* sp.

Boiled in KHO they exhibit a reddish-purple colour: diameter of mouth-parts 165 μ; caudal bristles about 70 μ long; antennæ 8-jointed, very variable, one measured gave (1) a mere ring, (2) 24, (3) 39, (4) 39, (5) 51, (6) 21, (7) 15, (8) 10.

I think this is likely to prove a synonym of *P. prosopidis*, Maskell, but the description and figures given by Maskell are unsatisfactory.

Asterolecanium Townsendi, sp. n.

♀.—On the twigs of the plant, not making pits. Scale about 2 millim. diam., convex, circular, not carinate, or with sometimes traces of a keel posteriorly; colour bright opaque lemon-yellow; a slight irregular fringe of white rods, not all in one plane.

♀.—Turns crimson on boiling in KHO: diameter of mouth-parts about 120 μ; skin crowded with figure-of-8 glands; margin with a row of figure-of-8 glands (about 10 μ diam. and 10 apart) and a more or less double row of simple glands.

♂.—Scale elongate, about 1½ millim. long and ⅔ broad; similar to female scale in colour and texture, fringe more regular and distinct. ♂ (dry, from under scale) reddish, with a long caudal spike, as in the Diaspinæ; wings broad and ample, head broad, thorax very broad. Length of caudal spike 210 μ; breadth of thorax 420; breadth of wing 495.

Hab. Platanas, Jalisco, on "Guasima," Aug. 4.

Compared with *A. viridulum* the scales are larger and much more opaque. *A. Townsendi* really looks most like the European *A. fimbriatum*, but that has a double row of figure-of-8 glands on the margin.

Eriococcus aurescens, sp. n.

♀.—On twigs of "Guasima." Sac about 3½ millim. long, of the usual form, dense, but with a surface like a rough blanket; colour of sac a light reddish yellow, a sort of light apricot-colour. ♀. Boiled in KHO turns dull crimson, and stains the liquid light amber; globular or nearly so; antennæ and legs brown; spines numerous and large, about 48 μ long; caudal tubercles narrow and cylindrical, about 90 μ long and 45 broad at base, each emitting a stout bristle about 210 μ long; bristles on inner side of tibia and tarsus large. Measurements of legs and antennæ in μ:—Anterior leg—femur + trochanter 186, tibia 105, tarsus 120; middle leg—tibia 114, tarsus 159. Antennal joints: (1) 30–39, (2) 33–39, (3) 51–60, (4) 36–48, (5) 27–33, (6) 24–27, (7) 36–37. One antenna showed only six joints, with a long third joint (93 μ), the suture between 3 and 4 being practically obliterated.

Hab. Platanas, Jalisco, Aug. 4.

It has a dipterous parasite. The species is easily recognized by the colour of the sac; the 6-jointed aberration resembles the normal form of *E. cryptus* (Ckll.), which often has a yellowish ovisac.

Cryptokermes brasiliensis, Hempel.

Zapotlan, July 6, on *Mimosa* sp.

Previously known only from Brazil, whence I have specimens sent by Mr. Hempel. The early stages were not known, but are well represented in the Mexican material.

Egg.—Crimson, greatly elongated, about 285 μ long and 90 wide.

Newly hatched larva.—Pale crimson (after boiling in KHO), greatly elongated (about 285 μ long and 90 wide), without rows of spines, but with longitudinal rows of figure-of-8 glands; legs and antennæ well developed; caudal tubercles not elongated; anal tube present, but broad and shallow, with the anal lobes projecting; tibia very short; anterior legs with tibia about 8, tarsus 21 μ; a very long filiform digitule (21 μ) at end of tarsus.

Second stage.—Scales on twigs, broad oval, composed of the same granular yellowish lumps as the adult scale, but largely surrounded by white cottony filaments; a rather long white rod projects at hind end. The insect itself (dried specimens) is about 225 μ long and 150 broad (doubtless much longer in life); segmentation of abdomen strongly marked; a long white rod projecting from anal tube (as in *Antonina* and *Ourococcus*); the three last abdominal segments have on each side a very long (about 300 μ) bristle, after the manner of *Icerya* larvæ; legs and antennæ very dark ferruginous; antennæ 6-jointed, with an extremely short third joint (twice as broad as long) and a very large and long club, the basal part of which is slightly constricted, so as to simulate an additional joint. Joints 2 to 4 are cylindrical, 5 is cup-shaped. Measurements in μ:—(1) 36, (2) 45, (3) 18, (4) 39, (5) 24, (6) 105.

Third stage.—Oval, about 1600 μ long; turns crimson on boiling in KHO. Antennæ reddish, very short and stout, of 5 or 6 obscure joints, with many short bristles at the tip. They are about 135 μ long and 60 broad, and very close together, only about 45 μ apart. Legs very short and stout. Round dermal glands very numerous and exactly as in *Sphærococcus*. The anal region is provided with a tube and is quite after the manner of *Sphærococcus casuarinæ*.

I had been quite uncertain as to the relationships of *Cryptokermes* in the absence of the early stages. It is now clear that the genus is closely related to the Australian *Sphærococcus* and *Ourococcus*.

Chrysomphalus (*Melanaspis*) *tonilensis*, sp. n.

♀.—Scales on branches, about 2 millim. diam., oval to circular, strongly convex, rough, with concentric ridges, dark purplish brown to black; exuviæ large, shining black, sublateral, covered with an easily deciduous white film. Nearly spherical, about 1400 μ long, caudal end rather strongly chitinized. No circumgenital glands; dorsal glands rather numerous, minute, not over 3 μ diameter; anal orifice oval, about 21 μ long and 108 from hind end; genital orifice about 42 μ anterior to anal orifice; spines short, not over 12 μ long; no squames; three pairs of lobes, all low and broad, the second and third with a central depression or notch; a low prominence takes the place of the fourth lobe; club-shaped glands in pairs, those of each pair alike, all short, the longest only 18–21 μ long.

Hab. Tonila, Jalisco, Aug. 2, on stalk, branches, and root of a low bush "of sage family," with very hairy green parts.

The male scales also occurred in some numbers and are oblong, reddish brown, often conspicuously white posteriorly;

exuvia near the anterior end. Allied to *Chrysomphalus bromeliæ* (*Aspidiotus bromeliæ*, Newstead).

Chrysomphalus albopictus (Ckll.).

Colima, July 14, on leaves of orange.

Chrysomphalus agavis (Towns. & Ckll.).

Tonila, Jalisco, Aug. 7, on narrow-leafed *Yucca*. Volcan de Colima, Aug. 3, lower slopes, among pines, about 7500 ft., on *Agave*. Zapotlan, July 6 and 7, on *Agave*.

Some of the last-mentioned material is marked as collected by Townsend and Boyd.

Aspidiotus Crawii, Ckll.

Tonila, Aug. 3, on *Mimosa*.

Aspidiotus cydoniæ, Comst.

The more I see of this the more I feel assured that it is distinct from *A. lataniæ* and *A. Crawii*.

Tonila, Aug. 2 and 3, on *Lantana* and several other plants, evidently very abundant. Volcan de Colima, Aug. 3, at 7500 ft., on "Madroña" or "Manzanita." Base of Volcan de Colima, 7000 ft., on *Lantana*.

Aspidiotus persearum, Ckll.

Colima, July 14, on upperside of leaves of *Magnolia*. *A. persearum* was previously known only from Japan and the Sandwich Islands.

Aspidiotus hederæ, var. *Nerii* (Bch.).

Irapuato, July 4, on oleander.

Diaspis cacti, Comst.

Zapotlan, July 5, on *Opuntia*.

Diaspis Townsendi, Ckll.

Irapuato, July 4, on *Prosopis*.

Mytilaspis nigra, Ckll.

Zapotlan, July 7, on tree *Yucca* (smooth dark green leaf) and *Agave* sp. (narrow saw-edge leaf).

The specimens are smaller than the type, the female scale not over 3 millim. long, exuviæ 1 millim.; the median lobes are quite large, minutely crenulate; second lobes narrow. The male scale is brownish white, narrow, of the usual type, half the length of the female. The species is allied to *M. Gloveri.*

Mytilaspis mexicana, Ckll.

Zapotlan, July 8, on *Solanum* sp.

Mytilaspis argentata, Ckll.

El Salto, Cualata, Colima, July 26, on a low bush. Previously known only from Brazil.

Mytilaspis philococcus, Ckll.

Zapotlan, Jalisco, on tree *Yucca* and *Agave*; Irapuato, July 4, on post cactus.

East Las Vegas, New Mexico, U.S.A.,
Sept. 28, 1902.

LXIV.—*Notes on the Natural History of East Finmark.* By Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., F.L.S.

[Continued from p. 361.]

[As it was quite possible that in the introductory notes to these papers I might have fallen into some errors, I sent a proof to Herr Schneider and requested him to criticize closely. To-day (Nov. 13) I have received his reply. In respect of Mammalia:—

Vulpes lagopus, Linn. (Arctic Fox). The two hundred were killed by poison in one winter at Vardö (not Vadsö).

Halichærus grypus, Fabr. (Grey Seal), "is still living in Finmark. A large male specimen was killed at Soœrholt this last spring. I got the splendid cranium" (Schneider).

The following are verbal corrections. My head dredger's name should be spelt Bjerkeng (not Bjerking). M. Figenschau's place should be spelt Kirkenes (not Kirchenes); Bög Fiord should be read everywhere for Bog Fiord. Two important mistakes, which I cannot tell how I came to make, are:—

Page 344, line 12, *for* "Bombyces" *read* "Bombidæ."
Page 354, line 24, *for* "north-eastern" *read* "north-western."

MOLLUSCA (continued).

The following additional species and varieties were recorded in 1882 from Vardö and Kirkenes by J. Sparre Schneider [*]:—

Thesbia nana, Lovén.
Buccinum Donovani [†], Gray.
—— *fragile*, Verkruzen.
—— *parvulum*, Verkruzen.
Buccinum Humphreysianum, Ben.
Sipho Sarsii, Jeffr.
Helcion pellucidum, Linn.
Gibbula cineraria, Linn.

Since the preceding part was sent to press I have received from Herr Friele an account of the Mollusca dredged by the 'Michael Sars' in 1900 [‡]. Among these are five species from the Porsanger Fiord which are additions to the fauna of East Finmark:—

Coryphella Sarsi, sp. n.
Dendronotus robustus, Verrill.
Acera bullata, O. F. Müller.
Ampullina Smithii, Brown.
Limopsis minuta, Phil.

The number of Mollusca of East Finmark, according to the foregoing lists, is 232; of these, 164 were found in 1890 by myself, and 68 are added on the authority of G. O. Sars, Lovén, Schneider, and Friele.

Professor G. O. Sars, in the concluding pages of his 'Mollusca regionis Arcticæ Norvegiæ,' 1878, divides the Norwegian Mollusca under the two headings of Arctic and Boreal species. Although I should myself refer a few of the species which he characterizes as arctic rather to a boreal origin (as he himself would perhaps do with our present knowledge of distribution), it may nevertheless be interesting to state that he classifies the whole of the species contained in the preceding lists as of arctic origin, with the exception of the following fourteen:—

---

[*] Schneider (J. Sparre), "Nogle zoologiske-iagttagelser fra Vardö," Tromsö Museums Aarsberetning, 1882, p. 81; and *Thesbia nana*, Lovén, from Kirkenes, Schneider, "Undersögelser af dyrelivet i de arktiske fjorde. III. Tromsösundets Molluskfauna," Tromsö Museums Aarshefter, viii. 1886, p. 22.

[†] This and the two following *Buccina* I regard as varieties of *B. undatum* and *B. grœnlandicum*.

[‡] Friele (H.), "Mollusken der ersten Nordmeerfahrt des Fischereidampfers 'Michael Sars' 1900 unter Leitung von Herrn Dr. Johan Hjort," Bergens Museums Aarbog, 1902.

Ommastrephes sagittatus.
Acera bullata.
Thesbia nana.
Trophon barvicensis.
Eulima bilineata.
Jeffreysia globularis.
Littorina obtusata.
Gibbula cineraria.
Helcion pellucidum.
Dentalium entalis.
Pecten tigrinus.
Dosinia exoleta.
Mactra subtruncata.
Poromya granulata.

In 1857 Dr. Danielssen made a zoological excursion in Nordland and Finmark, and published a full account of the Invertebrata* he met with. In his list the following Mollusca are recorded from Vadsö :—

Teredo norvegica.
Neaera cuspidata.
Thracia phaseolina, var. *arctica.*
Syndosmya intermedia.
Cardium edule.
—— *echinatum.*
—— *nodosum.*
—— *suecicum.*
Yoldia pygmaea.
Arca Korenii.
Pecten striatus.
—— *similis.*
Crania anomala.
Chiton asellus.
—— *laevis.*
—— *alveolus.*
Velutina haliotoidea.
Cylichna cylindracea.
Bulla Cranchii.

Now of these 19 species only 2 are arctic, while 17 are boreal, and it seems impossible not to suppose that some error has been made. Moreover, Sars has not entered these species in his East Finmark column.

In 1875 Mr. Verkrüzen, after a visit to East Finmark, published a paper†, in which a list is given of Mollusca found on different parts of the Norwegian coast. The entire list contains 190 species, but of these 97 are referred to East Finmark, and include the following Mollusca which are not in the lists which I have given :—

Utriculus obtusus.
Columbella nana.
Odostomia rissoides.
Odostomia acuta.
Rissoa albella.
Chiton cinereus.

In this paper Verkrüzen described *Buccinum finmarchianum*, *Margarita bella*, and *Montacuta Maltzani.*

In the following year Kobelt described and figured some Fusidæ and other Mollusca which Verkrüzen had brought back from East Finmark †. Among the species are *Sipho Verkrüzeni*, Kobelt, *Buccinum parvulum*, Verkrüzen, and *Admete undatocostata*, Verkrüzen.

---

* Danielssen (D. C.), "Beretning om en Zoologisk Reise foretagen i Sommeren 1857," Nyt Mag. for Naturvidenskaberne, vol. ii. 1861, pp. 1–58.

† Verkruzen (T. A.), "Bericht über einen Schabe-Ausflug im Sommer 1874," Jahrb. der deutschen malakozoologischen Gesellschaft, 1875, p. 229.

In 1881 M. Jules de Guerne, accompanied by other French naturalists, went to the Varanger Fiord on a "Mission scientifique." Two papers on the expedition were published by M. de Guerne ‡. These naturalists went in their vessel 'Coligny' to Elvenes, at the mouth of the Pasvik River, in order that they might proceed thence to Lake Onega, and thus they dredged in Klosterelv Fiord. The only list of Marine Invertebrata published by them is contained in the second paper. It is one of 97 species of Mollusca, which, with the exception of "*Rissoa proxima*, Alder," are recorded in my lists.

INLAND MOLLUSCA.

A paper entitled "Land and Freshwater Mollusca in the Arctic Regions of Norway," by Miss Birgithe Esmark §, gives the following list of the species known in East Finmark :—

Arion subfuscus, Drap. Mouth of the Tana River.

Vitrina angelicæ, Beck. Vardo.

Hyalinia petronella, Charp.*

Conulus fulvus, O. F. Muller. Vardo.

Patula harpa, Say. "Of this pretty little mollusk Schneider has in July found two dead specimens in the stem of a decayed birch-tree at Kirchenes in South Varanger. It was first found in North America, later in the country of Amur, but not yet in Siberia, while in Finland it goes as far as the shores of the Arctic Ocean."

Patula pygmæa, Drap. Vardo.

—— *ruderata*, Studer. Elvenes, in Sydvaranger.

Arionta arbustorum, Linn.*

---

† Kobelt (W.), "Beiträge zur arctischen Fauna," Jahrb. der deutschen malakozoologischen Gesellschaft, 1876, pp. 60, 105, 371.

‡ De Guerne (Jules), "Conférences faites par M. Jules de Guerne. Souvenirs d'une Mission Scientifique en Laponie," Union Géographique du Nord de France, 1882; and "Notes sur l'histoire naturelle des régions arctiques de l'Europe, le Varangerfjord," Bull. des Sci. de la Soc. roy. Malacol. de Belgique, vol. xviii. 1883, and xxi. 1886.

§ 'Tromsö Museums Aarshefter,' vol. v. 1882, p. 93.

* The species to which an asterisk is appended must, I think, be received with doubt. Miss Esmark does not give any locality for them, but has introduced them into the East Finmark column apparently (see p. 95) on the authority of G. O. Sars (Mollus. reg. Arct. Norveg. p. 309): but the column of Sars from which the names are taken does not relate to East

Pupa muscorum, L. Hornö at Vardö.

—— *inornata*, Mich., var. *Gredleri*, Closs., = *columella* (Bens.), Wester. Abundantly under stones on Horno at Vardo.

—— *arctica*, Wallenb. "This species is new to Norway. Mr. Schneider found it this summer under stones together with *P. Gredleri* on Horno at Vadso. Wallenberg found it first in Lulea Lapmark. Muller and Morch mention it from Greenland as *P. Hoppei*. It is found in many places in Sweden."

Succinea putris, Linn.*

Limnæa stagnalis, Linn. "At Gaddo-Luobbal, Pasvik River, in Sydvaranger."

Planorbis borealis, Lovén. "One shell from Varanger Fiord belongs to the museum at Upsala."

Margaritana margaritifera, Linn. Berlevaag in East Finmark.

CRUSTACEA.

As in the list of Mollusca, I have in the following notes inserted without locality the names of Crustacea which have been found in East Finmark by Sars and by others, but which were not met with by myself. This is therefore a complete catalogue of the Crustacea of this high northern district of Europe.

PODOPHTHALMA.

Hyas araneus, Linn. Bog Fiord.

—— *coarctatus*, Leach. Varanger and Lang Fiords.

Stenorhynchus rostratus, Linn.

Lithodes maia, Linn. Vadsö.

Eupagurus bernhardus, Linn. Varanger Fiord.

—— *pubescens*, Kroyer. Vadso, Lang, and Klosterelv Fiords.

Munida rugosa, Fabr. Vadso (*fide* Wollebæk, 1900).

Crangon vulgaris, Linn. Klosterelv Fiord and Svolvær. The former is, I believe, the most north-eastern locality of our common shrimp. M. Sars recorded it in 1858 from Öxfjord.

Pontophilus norvegicus, M. Sars.

---

but to the whole of Finmark; and why these three species have been inserted from that column, and not also *Hyalinia hammonis* and *Limnæa peregra*, there is no evidence to show. *If* a mistake has been made it has been repeated, since Westerlund, in "Land- och Sottvatten-Mollusker insamlade Vega-expeditionen" (Vega-expeditionens Vetenskapliga Iakttagelser, vol. iv. 1885, p. 148), gives a list of East Finmark Inland Mollusca which is identical with, and evidently has been taken from, the column "East Finmark" in Miss Esmark's paper.

Sclerocrangon boreas, Phipps. Varanger, Bög, and Klosterelv Fiords.

Sabinæa septemcarinata, Sabine. Vadsö, Klosterelv, and Lang Fiords.

—— *Sarsii*, S. I. Smith. One specimen, Lang Fiord.

Spirontocaris securifrons, Norman. Vadso Harbour; Lang and Klosterelv Fiords.

—— *Gaimardi*, H. M.-Edw. In all the fiords.

—— *polaris*, Sabine. Varanger, Bog, and Klosterelv Fiords; Svolvær.

—— *turgida*, Kroyer. In all the Sydvaranger Fiords, Laksefiord, and Tromso.

—— *pusiola*, Kröyer. Vadso; Klosterelv and Lang Fiords; Svolvær.

Pandalus borealis, Kröyer. Varanger Fiord.

—— *Montagui*, Leach.

Caridion Gordoni, Bate.

Mysis oculata, Fabr. Klosterelv Fiord.

Michtheimysis mixta, Lilljeborg. Bog and Klosterelv Fiords. Considering the number and characters of the genera into which the old genus *Mysis* has now been divided, *Mysis mixta* can no longer remain in the same genus as *M. oculata*. I therefore propose a genus *Michtheimysis* to receive it. From *Mysis*, as represented by *M. oculata* and its allies, it differs in having the antennal scale unprovided with a second joint, but drawn out to an excessive length, and finally terminated in a spine-like point. In the male the sexual fourth pleopod is quite different from the same organ in *Mysis* (proper) and agrees in structure with that of *Schistomysis*.

Erythrops Goësii, G. O. Sars. In all the fiords.

—— *abyssorum*, G. O. Sars. Varanger Fiord, 110–150 fathoms.

Pseudomma truncatum, S. I. Smith.

Amblyops abbreviata, G. O. Sars. Taken by the Norwegian North-Atlantic Expedition east of Vadso (Stat. 262).

Parerythrops robusta, S. I. Smith.

—— *abyssicola*, G. O. Sars.

Stilomysis grandis, Goës.

Macromysis inermis, Rathke. Klosterelv Fiord.

Nyctiphanes norvegica, M. Sars.

Thysanoessa neglecta, Kröyer, = *T. borealis*, G. O. Sars.

—— *longicaudata*, Kröyer, = *T. tenera*, G. O. Sars.

CUMACEA.

Lamprops fasciata, G. O. Sars. Vadso, Svolvær.

—— *fuscata*, G. O. Sars. Lang and Klosterelv Fiords.

Hemilamprops rosea, Norman. Lang and Bog Fiords.

—— *assimilis*, G. O. Sars.

Leucon nasicus, Kroyer. Lang and Klosterelv Fiords.

—— *fulvus*, G. O. Sars.

—— *acutirostris*, G. O. Sars.

Eudorella truncatula, Bate. Lang and Bog Fiords, only a single specimen in each locality.

—— *emarginata*, Kroyer. In all the fiords.

Diastylis Rathkii, Kroyer. In all the fiords.

var. *Sarsi*, nov. nom. The variety figured by Sars in 'Crustacea of Norway, Cumacea,' pl. lxx., occurred in 110–125 fathoms in the Varanger Fiord.

—— *lucifera*, Kroyer.

—— *spinulosa*, Heller.

—— *echinata*, Bate. Varanger Fiord, rare.

—— *scorpioides*, Lepechin. In all the fiords and down to 125 fathoms.

—— *Goodsiri*, Bell. Lang Fiord, in 5–30 fathoms.

Diastylopsis resima, Kroyer. In all the fiords, and especially abundant in a bay on the west side of Bog Fiord.

Leptostylis macrura, G. O. Sars.

—— *villosa*, G. O. Sars.

—— *ampullacea*, Lilljeborg.

Pseudocuma cercaria, J. van Ben.

Petalosarsia declivis, G. O. Sars.

Campylaspis rubicunda, Lillj. Bog Fiord.

—— *costata*, G. O. Sars.

ISOPODA.

Apseudes spinosus, M. Sars.

Sphyrapus anomalus, G. O. Sars.

Typhlotanais tenuicornis, G. O. Sars. Varanger Fiord, in 110-125 fathoms.

—— *finmarchicus*, G. O. Sars. Bog Fiord.

Leptognathia longiremis, Lillj. Varanger and Klosterelv Fiords.

—— *brevimana*, Lillj.

Pseudotanais forcipatus, Lillj. Klosterelv Fiord, 3-5 fathoms.

—— *macrocheles*, G. O. Sars.

Calathura brachiata, Stimpson. Varanger and Bög Fiords, 100–125 fathoms.

Gnathia elongata, Kröyer. In all the fiords.

Æga psora, Linn. One specimen in Varanger Fiord.

Limnoria lignorum, Rathke. Klosterelv Fiord.

Astacilla longicornis, Sow.

Idotea balthica, Pallas. Vadso and Svolvær.

—— *neglecta*, G. O. Sars. Vadso.

Janira maculosa, Leach. Klosterelv and Bog Fiords.

Jæra marina, Linn. Vadso, tide-marks.

Pleurogonium rubicundum, G. O. Sars. Vadsö.

—— *spinosissimum*, G. O. Sars.

Munnopsis typica, M. Sars. Varanger and Bög Fiords, in 80–120 fathoms.

Echinozone coronata, G. O. Sars.

Aspidarachna clypeata, G. O. Sars.

Ilyarachna hirticeps, G. O. Sars. Varanger Fiord.

Eurycope cornuta, G. O. Sars.

—— *producta*, G. O. Sars.

Bopyroides hippolytes, Kroyer.

Phryxus abdominalis, Kroyer.

Dajus mysidis, Kroyer.

AMPHIPODA.

Hyale Nilssoni, Rathke.

Opisa Eschrichti, Kroyer.

Socarnes Vahli, Kröyer. Vardo (*J. S. Schneider*).

Ambasia Danielsseni, Boeck. Lang and Klosterelv Fiords, but only a single example in each locality.

Aristias neglectus, Hansen. One only, Bög Fiord, 20–30 fathoms.

—— *tumidus*, Kroyer.

Hippomedon denticulatus, Bate. Entrance to Vadsö Harbour.

—— *propinquus*, G. O. Sars. A few specimens in Bög Fiord and off Vadso.

Orchomene serratus, Boeck. One only, Klosterelv Fiord, 2–5 fathoms.

—— *pectinatus*, G. O. Sars.

Tryphosa grœnlandica, Hansen.

—— *minuta*, Kröyer. Vadsö, Tromsö, and Svolvær.

Tryphosites longipes, Bate. Vadsö.

Anonyx nugax, Phipps. In all the fiords and at Tromsö and Svolvær.

Haplonyx cicada, Fabr. Varanger Fiord, down to 125 fathoms.

Centromedon pumilus, Lillj. Klosterelv Fiord, 2–5 fathoms.

Pseudalibrotus littoralis, Kröyer. In great abundance by washing sand dug at low water in Klosterelv Fiord and at Kirkenes.

Onesimus Edwardsi, Kröyer. Vadsö.

—— *plautus*, Kröyer. Recorded by Schneider from Vardö †.

**Menigrates obtusifrons*, Boeck. Svolvær.

Euonyx chelatus, Norman.

Lepidepecreum umbo, Goës. Lang Fiord, 20–30 fathoms.

Bathyporeia pelagica, Bate.

Argissa hamatipes, Norman, = *Argissa typica*, Boeck. Vadsö, 10–25 fathoms.

Phoxocephalus Holbolli, Kröyer. In all the fiords and at Tromsö and Svolvær.

Paraphoxus oculatus, G. O. Sars.

Harpinia neglecta, G. O. Sars. Throughout the district.

Pontoporeia femorata, Kröyer. In shallow water, Klosterelv and Bog Fiords.

Ampelisca Eschrichti, Kröyer. Varanger, Bög, and Lang Fiords, down to 125 fathoms.

—— *macrocephala*, Lillj. Throughout the district and also at Svolvær.

Byblis Gaimardi, Kröyer. Klosterelv, Lang, and Bog Fiords.

—— *erythrops*, G. O. Sars. Varanger Fiord.

Haploops tubicola, Lillj. Throughout the district.

—— *setosa*, Boeck. Varanger and Bog Fiords, to 80 fathoms.

Stegocephalus inflatus, Kröyer. Klosterelv Fiord, in 2–5 fathoms.

Andaniopsis nordlandica, Boeck. Bög Fiord, 20–30 fathoms.

Andaniella pectinata, G. O. Sars. One only, in the same locality as the last.

Astyra abyssi, Boeck.

Amphilochus manudens, Bate.

Amphilochoides odontonyx, Boeck.

Gitanopsis inermis, G. O. Sars.

—— *arctica*, G. O. Sars.

Gitana Sarsi, Boeck.

Metopa rubrovittata, G. O. Sars.

Sthenometopa robusta, G. O. Sars. Varanger Fiord, in 110–125 fathoms.

---

† For this and other species entered on Schneider's authority see Schneider (J. Sparre), "Nogle zoologiske-iagttagelser fra Vardö," Tromsö Museums Aarsberetning, 1882, p. 16.

In my paper on 'British Amphipoda,' Ann. & Mag. Nat. Hist. ser. 7, vol. vi. 1900, p. 45, I instituted a genus *Metopina* to receive *M. palmata* and its allies, including *M. robusta*. *Metopina* had, however, been previously used, and I therefore here substitute the name *Sthenometopa* for my genus.

Œdiceros saginatus, Kröyer. One specimen, west side of entrance to Vadsö Harbour, 25 fathoms.

Paroediceros lynceus, M. Sars. Very common in all the fiords and at Svolvær.

—— *propinquus*, Goës, = *Œdiceros microps*, G. O. Sars. Lang Fiord, in 5–30 fathoms.

Monoculodes tessellatus, Schneider. In all the fiords, in 5–30 fathoms.

—— *borealis*, Boeck. Very common in all the fiords and at Svolvær.

—— *subnudus*, Norman, = *M. falcatus*, G. O. Sars. Klosterelv and Lang Fiords, 5–30 fathoms.

—— *latimanus*, Goës. Lang and Bog Fiords, 5–30 fathoms.

—— *longirostris*, Goës. Lang and Bog Fiords, 5–50 fathoms.

—— *Packardi*, Boeck. Varanger Fiord, 100–125 fathoms.

—— *norvegicus*, Boeck.

—— *tuberculatus*, Boeck.

Monoculopsis longicornis, Boeck. Vadsö and Bog Fiord, 20–30 fathoms.

Perioculodes longimanus, Bate. Lang and Bog Fiords, 3–30 fathoms, and at Svolvær.

Halimedon brevicalcar, Goës. Bog Fiord, shallow water, and Svolvær.

—— *parvimanus*, Bate & Westw.

—— *megalops*, G. O. Sars.

Bathymedon obtusifrons, Hansen. Varanger and Bog Fiords, 50–125 fathoms.

Pontocrates arcticus, G. O. Sars.

Aceros phyllonyx, M. Sars. In all the fiords, 5–125 fathoms.

Aceroides latipes, G. O. Sars, = *Aceros distinguendus*, Hansen. One specimen, Varanger Fiord, 125 fathoms.

Pleustes panoplus, Kröyer. Vadsö and Svolvær.

Paramphithoe bicuspis, Kröyer. Vardö, *fide* Schneider.

—— *pulchella*, Kröyer. Varanger and Lang Fiords, 3–30 fathoms.

—— *brevicornis*, G. O. Sars.

Parapleustes latipes, M. Sars. Lang Fiord, 5 15 fathoms.

Parapleustes glaber, Boeck. Tromsö and Svolvær. Sars says that it is found "off the whole coast of Finmark."

—— *pulchellus*, G. O. Sars.

Acanthozone cuspidata, Lepechin.

Acanthonotosoma serratum, Fabr. Bog Fiord, 20–30 fathoms.

*—— *cristatum*, Owen. Svolvær.

Odius carinatus, Bate. Bog Fiord, 20–30 fathoms.

Syrrhoe crenulata, Goes. In all the fiords, 5–125 fathoms.

Tiron acanthurus, Lillj., = *Tessarops hastata*, Norman. Lang Fiord, 20–30 fathoms.

Pardalisca cuspidata, Kröyer. Klosterelv and Bog Fiords, in 5–10 fathoms.

Halice abyssi, Boeck.

Eusirus cuspidatus, Kröyer.

Rhachotropis Helleri, Boeck. One specimen, in the Varanger Fiord.

—— *inflata*, G. O. Sars, = *R. tumidus*, G. O. Sars. (Crust. Norway, Amphip. p. 430). Klosterelv Fiord, 3–5 fathoms.

—— *macropus*, G. O. Sars.

Halirages fulvocincta, M. Sars. Vadsö and Bog Fiord, 10–20 fathoms.

**Apherusa bispinosa*, Bate. Svolvær.

—— *tridentata*, Bruz.

—— *megalops*, G. O. Sars.

Calliopius læviusculus, Kroyer. Tide-marks, Vadsö.

**Paratylus uncinatus*, G. O. Sars. Svolvær, one specimen.

—— *Swammerdamii*, H. M.-Edw.

—— *Smitti*, Goës.

Dexamine spinosa, Mont. Svolvær. Dr. Danielssen found it at Vadsö.

—— *thea*, Boeck. Abundant, tide-marks, Vadsö.

Melphidippa borealis, Boeck.

Amathilla homari, Fabr. Vadsö and Bog Fiord, tide-marks and dredged in shallow water, also at Svolvær.

Gammarus locusta, Linn. Tide-marks throughout the district.

Melita Goesi, Hansen ('Oversigt over de paa Dijmphna-Togtet insamlade Krebsdyr,' 1886, p. 46, pl. xxi. fig. 13). A fine and quite perfect specimen, taken in Lang Fiord, in 20–30 fathoms. This species is at once distinguished from *Melita dentata* by the long, narrow, parallel-sided, basal joints of the last three pairs of peræopods and the less spinous armature of the mesosoma. New to the Norwegian fauna. Previously known from the Kara Sea and (?) Spitsbergen; and dredged by Mr. Whiteaves in the Gulf of St. Lawrence.

**Cheirocratus assimilis*, Lillj. Svolvær.

Lilljeborgia pallida, Bate. Lang and Klosterelv Fiords, in 5-25 fathoms.

—— *fissicornis*, M. Sars. One only, Bog Fiord, 20-30 fathoms.

Idunella aequicornis, G. O. Sars. Varanger Fiord, 100-125 fathoms.

Microdeutopus sp. A small female, too young to assign with certainty to a species.

Protomedeia fasciata, Kröyer. Abundant in all the fiords of Sydvaranger; also at Svolvær.

Gammaropsis melanops, G. O. Sars. Varanger Fiord.

Photis tenuicornis, G. O. Sars. Vadso, in 10-25 fathoms.

—— *Reinhardi*, Kröyer.

Amphithoe rubricata, Mont. Vadsö and Svolvær.

Ischyrocerus anguipes, Kröyer. Vadso, tide-marks.

*—— *megalops*, G. O. Sars. Svolvær.

—— *minutus*, Lillj. Vadso.

Parajassa pelagica, Leach, = *Podocerus capillatus*, Rathke. Vadso, tide-marks.

Corophium crassicorne, Bruz. Vadsö and Lang Fiord, Tromsö, Svolvær.

affine, Bruz. Vadsö, Klosterelv and Bog Fiords.

Unciola leucopis, Kröyer. Varanger Fiord, 120 150 fathoms.

—— *planipes*, Norman.

Dulichia curticauda, Boeck. Klosterelv Fiord, 2 5 fathoms.

—— *porrecta*, Bate. Klosterelv Fiord, 2 5 fathoms.

—— *spinosissima*, Kröyer.

—— *monacantha*, Metzger.

—— *falcata*, Bate.

Phtisica marina, Slabber.

Caprella linearis, Linn. One male. Varanger Fiord.

—— *septentrionalis*, Kröyer. Varanger Fiord, Tromsö.

Paracyamus boopis, Lütken.

PHYLLOCARIDA.

Nebalia bipes, Fabr. Vadsö.

PHYLLOPODA.

The following three Phyllopoda and two of the Cladocera have been found by Sars in East Finmark:—

Branchinecta paludosa, O. F. Müll.

Polyartemia forcipata, S. Fischer.

Limnetis brachyurus, O. F. Müll.

CLADOCERA.

Holopedium gibberum, Zaddach. Sydvaranger.
Daphnia magna, Strauss.
Cephaloxus cristatus, G. O. Sars. Kirchenes.
**Ceriodaphnia quadrangula*, O. F. Mull. Hammerfest.
Bosmina obtusirostris, G. O. Sars. Sydvaranger and Hammerfest.
Macrothrix arctica, G. O. Sars.
Acantholeberis curvirostris, O. F. Mull. Sydvaranger.
Ophryoxus gracilis, G. O. Sars. Vardo and Sydvaranger.
Alonopsis elongata, G. O. Sars. Sydvaranger, also Hammerfest.
Acroperus harpæ, Baird. Sydvaranger.
Alonella excisa, S. Fischer. Sydvaranger.
—— *nana*, Baird. Sydvaranger.
**Chydorus sphæricus*, O. F. Mull. Hammerfest.
Polyphemus pediculus, Linné. Sydvaranger, also Hammerfest.
**Bythotrephes Cederstromii*, Schœdler. Tromso.

OSTRACODA.

In the Annals & Mag. Nat. Hist. ser. 6, vol. vii. (1891) p. 108, I published "Notes on the Marine Crustacea Ostracoda of Norway," among which were included the species I had obtained in East Finmark in 1890. Referring to that paper for an account of exact localities &c., I give here a list of the Ostracoda obtained, in order to make this enumeration of the Crustacea of East Finmark complete.

Pontocypris trigonella, G. O. Sars.
Argillœcia cylindrica, G. O. Sars.
Cythere lutea, Müller.
—— *pellucida*, Baird.
—— *confusa*, Brady & Norman.
—— *gibbosa*, Brady & Robertson.
—— *limicola*, Norman.
—— *cluthæ*, Brady, Crosskey, & Robertson.
—— *villosa*, G. O. Sars.
—— *tuberculata*, G. O. Sars.
—— *concinna*, R. Jones.
—— *emarginata*, G. O. Sars.
—— *finmarchica*, G. O. Sars.
—— *angulata*, G. O. Sars.
—— *mirabilis*, G. S. Brady.
—— *dunelmensis*, Norman.
Cytheridea papillosa, R. Jones.
—— *punctillata*, G. S. Brady.
Cytheridea Sorbyana, R. Jones.
Eucythere declivis, Norman.
—— ——, var. *argus*, G. O. Sars.
Krithe bartonensis, R. Jones.
Loxoconcha tamarindus, R. Jones.
—— *fragilis*, G. O. Sars.
Xestoleberis depressa, G. O. Sars.
Cytherura affinis, G. O. Sars.
—— *sella*, G. O. Sars.
—— *undata*, G. O. Sars.
—— *grœnlandica*, Brady & Norman.
—— *similis*, G. O. Sars.
—— *nigrescens*, Baird.
—— *rudis*, G. S. Brady.
—— *cellulosa*, Norman.
Cytheropteron latissimum, Norman.

Cytheropteron nodosum, G. S. Brady.
Bythocythere constricta, G.O. Sars.
—— *recta*, G. S. Brady.
Pseudocythere caudata, G.O. Sars.
Sclerochilus contortus, Norman.
Paradoxostoma variabile, Baird.
—— *rostratum*, G. O. Sars.
—— *inflexum*, Brady & Norman.
Polycope orbicularis, G. O. Sars.
Philomedes brenda, Baird.

The six following species were additions to the Norwegian fauna:—

Cythere cluthæ.
—— *mirabilis.*
Cytherura grœnlandica.
Cytherura rudis.
Bythocythere recta.
Paradoxostoma inflexum.

Professor G. O. Sars has recorded the following additional species from East Finmark:—

Herpetocypris glacialis, G. O. Sars.

The following East Finmark Crustacea have as yet not been found elsewhere:—

Typhlotanais finmarchica.
Pseudotanais Lilljeborgii.
Gitanopsis inermis.
—— *arctica.*
Apherusa megalops.
Paradoxostoma rostratum.
—— *inflexum.*

Arctic species not known to occur further south than East Finmark:—

Pseudomma truncatum.
Mysis oculata.
Dyastylis spinulosa.
Calathura brachiata.
Dajus mysidis.
Opisa Eschrichtii.
Aristias tumidus.
Œdiceros borealis.
—— *saginatus.*
Monoculodes longimanus.
Aceroides latipes.
Parapleustes pulchellus.
Paratylus Smitti.
Mæra Goesii.
Idunella æquicornis.
Unciola leucopis.
Paracyamus boopis (?).
Cytherura grœnlandica.
—— *rudis.*
Herpetocypris glacialis.

Species which are not as yet known to occur under more arctic conditions than those of East Finmark:—

Stenorhynchus rostratus.
Crangon vulgaris.
Spirontocaris securifrons.
Caridion Gordoni.
Parerythrops abyssicola.
Mysideis insignis.
Macromysis inermis.
Lamprops fasciata.
Hemilamprops rosea.
—— *assimilis.*
Leucon acutirostris.
Eudorella truncatula.
Leptostylis villosa.
—— *ampullacea.*
Pseudocuma cercaria.
Campylaspis costata.

Apseudes spinosus.
Leptognathia brevimana.
Pseudotanais macrocheles.
Limnoria lignorum.
Idotea baltica.
—— *neglecta.*
Astacilla longicornis.
Pleurogonium rubicundum.
—— *spinosissimum.*
Echinozone coronata.
Aspidarachna clypeata.
Pseudarachna hirsuta.
Eurycope cornuta.
—— *producta.*
Hyale Nilssoni.
Ambasia Danielsseni.
Hippomedon denticulatus.
—— *propinquus.*
Tryphosites longipes.
Euonyx chelatus.
Harpinia neglecta.
Byblis erythrops.
Andaniopsis nordlandica.
Astyra abyssi.
Gitana Sarsii.
Metopa rubrovittata.
Sthenometopa robusta.
Monoculodes tessellatus.
—— *norvegicus.*
—— *subnudus.*
Monoculodes Packardi.
Perioculodes longimanus.
Halimedon parvimanus.
Paramphithoe brevicornis.
Parapleustes latipes.
Halice abyssi.
Rhachotropis Helleri (?).
Apherusa tridentata.
Paratylus Swammerdamii.
Dexamine spinosa.
—— *thea.*
Melphidippa borealis.
Liljeborgia pallida.
Parajassa pelagica.
Corophium affine.
Dulichia monacantha.
—— *falcata.*
Phtisica marina.
Pontocypris trigonella.
Argillaecia cylindrica.
Cythere pellucida.
Loxoconcha fragilis.
Cytherura affinis.
—— *sella.*
—— *similis.*
—— *nigrescens.*
—— *cellulosa.*
Cytheropteron nodosum.
Bythocythere recta.
Polycope orbicularis.

Future investigations will undoubtedly greatly modify these lists, and also, though in a very much less degree, the division of the Mollusca into Arctic and Boreal species.

North and south are not in these papers so much regarded as affecting distribution as the more or less arctic conditions. Thus from a distributional point of view the North Cape, although really north of the greater part of East Finmark, may be regarded zoologically as to the south, since all boreal species must pass round the North Cape to reach East Finmark, and are also at the North Cape living under less arctic conditions. On the other hand, all South Greenland, Iceland, and the Murman coast may zoologically be considered to be more northern, since their climate is more arctic.

[To be continued.]

LXV.—*On Five new Mammals from Arabia and Persia.*

By OLDFIELD THOMAS.

THROUGH the instrumentality of my colleague Mr. W. R. Ogilvie-Grant, Mr. G. W. Bury has been making a collection of mammals and birds in the high country to the north of Aden, on the borders of Yemen. Among the specimens so obtained are three genets (the genus *Genetta* not having been previously recorded from Arabia), a new *Meriones*, and examples of the Arabian fox, which I now think should have a special subspecific name. While working these out I have taken the opportunity to describe another fox from Northern Persia and a mouse obtained in Central Persia by Mr. Witherby.

Genetta Grantii, sp. n.

A member of the *G. dongolana* group and very similar to the red-spotted East-African species (*G. suahelica*, Matsch.). Centre line of back from behind withers to tail with a narrow black line; all other body-markings reddish fulvous. Head grey, with a well-defined dark median line, bordered on each side with a broader white streak. Nape with seven narrow dark lines, all of about equal breadth, diverging as they run backwards as usual. Sides each with five lines of spots, the upper line irregularly united into a more or less continuous streak. Under surface dull greyish, not so buffy as in *G. suahelica*. Ears grey, without darker spots at their posterior base. Forearms grizzled greyish, almost without spots, scarcely darker behind; fore feet greyish white, the outer edge of the metacarpal blackened below. Hind limbs indistinctly spotted above, the usual black patch above the ankle inconspicuous. Tail long-haired and shaggy, the rings not sharply marked, owing to the overlapping of the hairs; indeed they are scarcely definable proximally; dark rings eleven or twelve in number, each rather shorter than the light ones dividing them; light rings washed with dull fulvous above.

Dimensions of the type (measured in the flesh):—

Head and body 414 millim.; tail 426; hind foot 78; ear 32.

Skull: basal length 75; zygomatic breadth 39; palate length 38.

Hab. Azraki Ravine, Haushabi, Southern Arabia. Alt. 5200 feet.

Type. Male. Original number 7. Collected 30th May, 1902, by G. W. Bury. Three specimens.

Meriones Buryi, sp. n.

A tufted-tailed *Meriones*, with naked feet, superficially resembling *Gerbillus persicus*, Blanf.

Size fairly large. General characters of *Meriones*, but with wholly naked soles, which are apparently, as in "*Gerbillus*" *persicus*, granulated and quadrituberculate. General colour above deep "clay-colour," strongly grizzled with black; sides clearer fawn; belly dull buffy white, some of the hairs slaty based, others white to their roots; lips and chin white; chest with an ill-defined drabby patch. Median line of head like back; cheeks and ocular area grizzled grey; ears of medium length, their substance dark, their few fine hairs drabby fawn. Rump with a number of longer whitish-tipped hairs intermixed with the fur. Upper surface of hands and feet pale fawn. Tail long, dark fawn all round proximally, heavily black-crested above for its terminal half, the longest hairs attaining 15–18 millim.

Skull stout and less strongly built; supraorbital region heavily ridged; palatal foramina long, reaching just to the level of the front of m^1; bullæ not excessively swollen.

Dimensions of the type (measured in the flesh):—

Head and body 148 millim.; tail 168; hind foot (s. u.) 33; ear 21.

Skull: basilar length 32·5; zygomatic breadth 21·7; interorbital breadth 6·6; palate length 19; diastema 11; palatal foramina 7·7; length of bullæ 12; length of upper molar series (crowns) 5·6.

Hab. Zal êd, Haushabi, in the hills north of Aden; altitude 4300 feet.

Type. Female. Collected 13th September, 1902, by Mr. G. W. Bury, after whom the species is named. Three specimens examined.

Owing to the fact that worn molars of *Meriones* are quite indistinguishable from those of *Gerbillus*, *Dipodillus*, &c., and that this species has the Dipodilline character of wholly naked soles, *Meriones Buryi* might easily be taken for a member of the latter group, in which it would stand near "*Gerbillus*" *persicus*, whose proportions and foot-characters are not dissimilar. Unfortunately no young specimens, showing the true molar structure, of either *G. persicus* or *M. Buryi* are available, and until that is the case I shall not feel satisfied about the proper allocation of either form. But in general skull-structure *M. Buryi* resembles some of the most typical species of *Meriones*, and I therefore now refer it to that genus, within which it may be readily distinguished by the characters above given.

"*Gerbillus*" *calurus* is another species of doubtful position, and it appears probable that the examination of young specimens will show it to be also a *Meriones*.

Vulpes vulpes arabica, subsp. n.

Allied to the Egyptian fox (*V. v. ægyptiaca*), but smaller and differently coloured.

Size intermediate between *V. vulpes* and *V. leucopus*. General tone of dorsal area rich tawny ochraceous, the hairs being not or rarely grizzled with grey. In the Egyptian fox the back is profusely grizzled and the general tone is much deader and browner. Face, and especially crown, bright fulvous, often conspicuous in specimens whose bodies are in the brown, out-of-season, pelage. Ear-backs rarely deep black, more often greyish, and sometimes scarcely darker than the head. The usual light patches in front of and behind the shoulders dull yellowish. Chin and belly dull whitish; chest with a variable amount of black upon it. Tail of medium thickness, dull greyish fulvous, its tip generally inconspicuously white. Skull shorter, broader, and rather more depressed than in the Egyptian fox.

Dimensions of the type (measured in skin):—

Head and body 610 millim.; tail 320; hind foot 130; ear 98.

Skull: basal length 120; greatest breadth 68; interorbital breadth 24·3; breadth of brain-case 43·6; palate, length 64, breadth between outer sides of p^4 38; outer length of p^4 11·8; greatest diameter of m^1 11·7, of m^2 8·6; combined antero-posterior diameter of the two latter teeth 12·7.

Hab. (of type). Muscat. Other specimens from Aden and the Hadramaut.

Type. Adult female. B.M. no. 94. 3. 9. 1. Collected and presented by Surg.-Gen. A. S. G. Jayakar.

On account of its more vivid colour the Arabian fox seems to deserve a subspecific name, though its considerable variability makes it somewhat difficult to describe. Of previously named forms Gray's "*V. flavescens*," said to be from Persia, is a much paler and longer furred animal. Blanford's *V. persica* is probably synonymous with *V. flavescens*, but the type is in such bad pelage that the point cannot be settled at present.

Vulpes vulpes splendens, subsp. n.

A large long-haired fox of a vivid fulvous colour.

Size large, skull equal to that of the largest Siberian foxes. General colour above all over rich bright tawny ochraceous, grizzled with white on the posterior half of the back. This rich colour is not confined to a narrow dorsal area, but extends over the whole upper surface, crown, nape, back, and sides. Individually the hairs are brownish basally, rich ochraceous terminally, with a whitish subterminal band in the posterior dorsal ring. Muzzle reddish brown. Backs of ears orange-fulvous at their anterior bases, deep black terminally. Belly and proximal part of limbs a rich deep reddish, between "hazel" and "ochraceous-rufous" of Ridgway; lips and chin greyish; chest white, with brown bases to the hairs. Hands and feet very thickly furred, grizzled black above, red on the sides and, more dully, below. Tail very large and thick, forming a fine brush of a fulvous nearly as vivid as that of the body; some of the hairs black-tipped and all with greyish bases; a distinct white tip to the tail.

Skull stout and heavy, with a large rounded brain-case; decidedly larger than in the southern Persian and Arabian forms—more as in Siberian examples. Frontal region more or less convex, less markedly flattened than usual. Interorbital and intertemporal region broad.

Dimensions of the type (measured in skin):—

Head and body 780 millim.; tail 490; hind foot 162; ear 93.

Skull: basal length 132; zygomatic breadth 77; interorbital breadth 29; intertemporal breadth 26·5; breadth of brain-case 48; palate length 70; length of p^4 (outside) 14; greatest diameter of m^1 13 3, of m^2 8, combined length of two latter teeth 15.

Hab. Astrabad, N. Persia.

Type. B.M. no. 83. 2. 10. 1. Collected by Lieut.-Col. Beresford-Lovett.

This magnificent fox exceeds in the richness of its coloration any Old-World form with which I am acquainted. Not only is the fulvous of its upper surface far brighter than in other races, but the deep rich rufous of its belly distinguishes it from all its allies. Still it is no doubt only a local race of the common fox, and would grade westwards into *V. vulpes*, southwards into *V. v. flavescens*, and eastwards into *V. v. montana.*

Mus sylvaticus Witherbyi, subsp. n.

A mouse of the *M. sylvaticus* group, with pure white belly and very small teeth.

Size as in small forms of *M. sylvaticus*. General colour pale grey, but cheeks and sides clear fulvous, which is no doubt the colour of the whole upper surface when in fully adult pelage. Under surface, from lips and chin to anus, inner sides of limbs, and whole of hands and feet pure snowy white, the hairs white to their roots, except just on the chest, where they have slaty bases. Ears of medium length, grey. Tail longer than the head and body, sharply bicolor, blackish above, pure white below.

Skull as compared with that of *M. s. arianus*, Blanf., rather smaller, and with decidedly smaller teeth.

Dimensions of the type (measured in the flesh):—

Head and body 93 millim.; tail 102; hind foot 21; ear 16.

Skull: greatest length 25·5; basilar length 19·6; interorbital breadth 3·8; palate length 11; palatal foramina 4·8; length of upper molar series 3·2.

Hab. Near Sheoul, Fars, Persia. Altitude 5200 feet.

Type. Male, young adult. B.M. no. 2. 10. 1. 14. Collected 15th May, 1902, and presented by Harry F. Witherby, Esq.

This is evidently a desert form of the *Mus sylvaticus* group, its snowy-white belly distinguishing it from every described race. Its nearest geographical ally, *M. s. arianus*, Blanf., from Kohrud, N. of Isfahan, has also markedly larger teeth.

I have named this pretty mouse in honour of Mr. Witherby, to whom the National Museum owes examples of several interesting Persian mammals.

LXVI.—*Two new Australian Small Mammals.*
By OLDFIELD THOMAS.

Mus ferculinus, sp. n.

An insular form of the West-Australian *M. nanus*, Gould.

Size about as in *M. nanus*. General colour pale greyish brown, paler than in *M. nanus*; head darker brown than the back. Ears rather short, laid forward in a spirit-specimen they only just reach to the posterior canthus of the eye. Upper surface of hands and feet dull greyish white; fifth hind toe short, reaching without claw barely to the base of the fourth; external metatarsal pad of soles almost or quite obsolete; internal metatarsal oval. Tail rather shorter than the head and body, very finely scaled (14–15 rings to the centimetre), finely haired, brown above, dull white below.

Skull about as in *M. nanus*.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 96 millim.; tail 93; hind foot (s. u.) 23 7; ear 12·5.

Skull: greatest length 27; basilar length 20·6; zygomatic breadth 14·5; nasal length 9·7; interorbital breadth 4; palatal foramina 5·6; diastema 6·4; length of upper molar series 5·2.

An older specimen has a head and body length of 103 millim.; tail 93; hind foot 24.

Hab. Barrow Island, N.W. Australia.

Type. Young adult female. B.M. no. 2. 10. 10. 7. Collected by Mr. Tunney, and presented by the Perth Museum, Western Australia. Five specimens examined.

I owe to the kindness of Mr. B. H. Woodward, Curator of the Perth Museum, the opportunity of describing this Barrow Island rat, which appears to be a pale insular form of Gould's *Mus nanus*.

Sminthopsis crassicaudata centralis, subsp. n.

A pale desert form of *S. crassicaudata*.

General colour pale "isabella," finely grizzled with brown, clearing on sides to "cream-buff," sharply defined from the snowy white of the underside, where, however, the hairs are as usual all slaty based. Muzzle and sides of face dull creamy white; median frontal and nuchal area darker, edged on each side, round the bases of the ears, with buffy; a white spot behind the posterior base of each ear. Hands and feet pure white. Fine hairs of ears and tail white, the greyish skin showing through. Tail apparently rather longer than in typical *crassicaudata*.

Dimensions of the type (measured in the flesh):—

Head and body 79 millim.; tail 63; hind foot (s. u.) 15·5; ear 22.

Skull: basal length 23; combined length of three anterior molariform teeth 4·7.

Hab. Killalpanima, Lake Eyre East, desert region of South Australia.

Type. Male. B.M. no. 2. 9. 8. 7. Collected 21st June, 1902, and presented by H. J. Hillier, Esq.

Native name in Diari language "chooda-chooda."

This is the central desert representative of *S. crassicaudata*, and shows the usual desert pallor. Its tail, as already pointed out by Prof. Spencer*, is rather longer than in ordinary coast specimens.

---

* Horn Exp. ii p. 31 (1896).

LXVII.—*On Azara's "Chauve-souris onzième"* (Myotis ruber, *Geoff.*) *and a new Species allied to it.* By OLDFIELD THOMAS.

WHEN giving an account of Mr. W. Foster's Paraguayan bats[*] I was not able definitely to determine Azara's "Chauve-souris onzième" (*Myotis ruber*, Geoff.), but suggested that a certain fawn-coloured species already known to me from Argentina might prove to represent it.

Mr. Foster has now sent to us three specimens of a *Myotis* which, on grounds both of locality and the exactitude of its agreement with Azara's description, I have no hesitation in identifying with his species.

This bat, which must bear the name of *Myotis ruber*[†], Geoff., is a fairly large animal (forearm 40 millim.), with rather short velvety fur and medium-sized ears deeply excavated on their outer margin. In colour it is uniform rufous-brown above (" Mars brown "), the hairs scarcely or not darker towards their roots, and rather paler below, the posterior belly and anal region gradually becoming strong ochraceous yellow, just as in the same part of its body *M. albescens* becomes conspicuously white.

The skull is large and heavy for the group, with particularly stout powerful canines, which are conspicuously visible in an upper view of the skull.

From this bat the Argentine one formerly referred with doubt to *M. ruber* is clearly distinct, and there being apparently no other name available, it may be called

Myotis Dinellii, sp. n.

Size less than in *M. ruber*, the difference being most marked in the skull.

Fur comparatively long (hairs on back about 7–7·5 millim. in length), wavy as in most species, not velvety. Hairs extending but little on to interfemoral above, and not at all below; no interfemoral fringe. General colour above uniform dull rufous-cinnamon, the basal halves of the hairs slaty black; under surface dull " isabella," mixed with the slaty bases of the hairs. Membranes uniformly dark, without whiter edging, but the lines on the under surface of the interfemoral white.

---

[*] Ann. & Mag. Nat. Hist. (7) viii. p. 443 (1901).

[†] D'Orbigny's correct reference to this bat under the name of "*Vespertilio ruber*" is misquoted by Lataste (Act. Soc. Sci. Chili, i. p. 79, 1892) and Trouessart (Mamm. p. 131, 1899) as *V. rufus*.

Ears fairly long, their anterior edge evenly convex, their posterior deeply emarginate.

Skull and teeth of normal proportions, the canines scarcely visible from above. Small upper premolars subequal in transverse area, the posterior about half the height of the anterior, very slightly drawn inwards, and clearly visible from without.

Dimensions of the type:—

Forearm 39 millim.

Head and body 41; tail 41; ear 14; third metacarpal 35; lower leg 17; hind foot (s. u.) 7·5.

Skull: front of canine to back of m^3 5·5; greatest length (in another specimen) 14·5.

Hab. Tucuman. Other specimens from Salta (*Spegazzini*) and Bolivia (*Simons*).

Type. Female. B.M. no. 0. 7. 9. 4. Collected 7th April, 1899, by L. Dinelli; presented by Oldfield Thomas. Five specimens examined from the type locality.

It would thus appear that in Paraguay and the neighbouring parts of Argentina four species of *Myotis* are to be found, distinguishable as follows:—

General colour dark greyish or blackish.	
Lower belly not whiter. No naked patch between shoulders	*M. nigricans*, Wied.
Lower belly passing into white. A naked patch between shoulders.............	*M. albescens*, Geoff.
General colour more or less rufous or fawn.	
Lower belly passing into yellow. Dorsal fur short, reddish throughout	*M. ruber*, Geoff.
Lower belly not yellow. Dorsal fur long, dark at base	*M. Dinellii*, Thos.

LXVIII.—*Description of a new Snake of the Genus* Pseudechis *from Queensland.* By G. A. Boulenger, F.R.S.

Pseudechis Colletti.

Eye rather small, its diameter nearly equalling its distance from the mouth. Rostral as deep as broad? (end of snout damaged in the single specimen); frontal small, once and a half as long as broad, not longer than the præfrontals, much narrower than the supraoculars, half as long as the parietals;

posterior nasal in contact with the single præocular; two postoculars; temporals 2+2, first lower very large and wedged in between the fifth and sixth labials; six upper labials, third and fourth entering the eye, third, fourth, and fifth equal in depth. Scales in 25 rows on the neck, in 19 on the body. Ventrals 223; anal divided; subcaudals 60, mostly single, only the 9 last divided. Dark brown above, with irregular yellowish blotches; a yellowish vertebral streak on the nape; sides and lower parts yellowish.

Total length 450 millim.; tail 65.

A young specimen from Queensland, locality unknown, for which I am indebted to my friend Prof. R. Collett.

This species differs from *P. papuanus*, Ptrs. & Dor., to which it is most nearly related, in the narrower frontal shield, the equal depth of the third, fourth, and fifth labials, and the small number of divided subcaudals.

LXIX.—*New Eastern Heterocera.*

By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family **Agaristidæ.**

Eusemia solicita, nov.

♂. Antennæ, palpi, head, thorax, and fore wings black, palpi with a white band on first and third joints; face with a white spot on each side in front, a white spot between the antennæ, and four white spots on the front of thorax; abdomen ochreous yellow, with black segmental bands, which are broadest above: fore wings with two ochreous-white transverse bands—the first from the subcostal vein across the middle of the cell, extending downwards nearly to vein 1, the second across the disk from near the costa one third from apex to near outer margin above the hinder angle; also from two to four subapical white dots; in the nine examples before me these bands vary more or less, some being nearly even and some sinuated: the hind wing is reddish orange, with black basal, costal, and outer marginal bands, the outer band attenuated towards the anal angle and its inner margin sinuous; in the middle of the costa there is a knob-shaped production inwards; a short thick black band from the abdominal margin, above the angle, connected by two black lines with the marginal band, two white dots on the apical portion of the marginal black band, sometimes three, sometimes none at all.

Expanse of wings $2\frac{1}{4}$ inches.

Kina Balu (*Waterstradt*), Sandakan.

There is in the B. M. one example from Sarawak and two without locality with *E. vetula*, Hübner, and one from Sarawak and another marked Borneo with *E. conspicua*, Rothschild: it is allied to the latter, but is, I am convinced, quite distinct; it is much smaller and the inner band on fore wings is in quite a different position.

Family **Lymantriidæ.**

Euproctis oreosaura.

Adhullia oreosaura, Swinh. Ann. & Mag. Nat. Hist. (6) xiv. p. 435 (1894).

Type ♀, Cherra Punji, in B. M.

I have now received a male of this rare and handsome moth: the fore wings are coloured and marked as in the female; the hind wings are much whiter, slightly tinged with yellow in the costal and outer marginal spaces, the interior pale red-brown.

Expanse of wings $2\frac{1}{10}$ inches.

I have also received a pair from Malang, Java.

Family **Euteliidæ.**

Targalla apicifascia.

Eutelia apicifascia, Hmpsn. Moths India, ii. p. 394 (1894).

Type ♀, Bombay, in B. M.

I have both sexes from Port Blair, Andaman Islands (*Hamilton*), and from Goping, Perak (*Kunstler*). It belongs to Hampson's Section I., and not Section III., the antennæ of the male being simple and not bipectinate.

Family **Quadrifidæ.**

Sypna finella, nov.

♂ ♀. Head, body, and fore wings dark pink-brown, tinged with ochreous; costa of fore wings with three duplex pale spots—subbasal, antemedial, and medial—indicating the commencement of three duplex, transverse, ochreous, very indistinct bands; a straight ochreous thin band across the disk, connected with the outer margin above the middle by a broad dull ochreous patch; a rather prominent ochreous spot at end of cell; submarginal black spots each containing duplex ochreous points; marginal pale line and black cilia with dull ochreous spaces at the vein ends; two pairs of white dots on the costa towards the apex: hind wings brown; an indistinct ochreous central band, a short similar band running up from the anal angle, a large ochreous space occupying the apical half of the outer margin. Underside ochreous, with brown transverse bands somewhat similar to those in *S. diversipennis*, Walker, but the central band of fore wings is more curved, the inner and outer bands broader and darker, as is also the outer band of hind wings.

Expanse of wings $2\frac{3}{10}$ inches.

Kina Balu, N. Borneo (*Waterstradt*).

Allied to nothing I know of.

Ischyja Anna, nov.

♂. Eyes deep black; palpi brown, sprinkled with white scales and with the first two joints pure white beneath; body and wings brown, with a bronzy tint, and irrorated with minute grey atoms: fore wings with the orbicular and reniform shaped much as in *I. manlia*, but indistinct and not prominent as in that species; the deep black bars entirely wanting; a straight duplex line with pale centre from costa one fourth from apex to hinder margin one third from the angle, the inner side of this line broadly black; between this line and the base and below the cell is a brown triangle filling up nearly the whole space, its outer side parallel with the discal line: the hind wing has a broad, discal, blue-grey, short band much as in *manlia*, with the outer portions blackish, and similar anal spot. The underside is dull pale brown; fore wings with an upper discal short whitish band much as in *manlia*; the hind wings white, with a blue tinge, a broad marginal band, and a brown sinuous medial line.

Expanse of wings 3 inches.

Kina Balu, N. Borneo (*Waterstradt*).

Allied to *I. Hageni*, Snellen, from Sumatra (Tijd. v. Ent. xxviii. p. 7, pl. i. fig. 3, 1885), but this species has a large brown ring with irregular sides on the inner disk of fore wings above, and not a triangle as in *Anna*; the white on the hind wings below has a band of spots across it and the palpi are not white beneath.

Ischyja recta, nov.

♂. Like *A. Anna*; also with the palpi pure white beneath, as in *Anna*, but the mark in the interior disk of fore wings is shaped differently to any other species in the genus, being very nearly square, with the lower side formed by the hinder margin.

Expanse of wings 3 inches.

Singapore, Sandakan. Type in B. M.

Ischyja ebusa, nov.

♀. Palpi, head, body, and more than the inner half of fore wings purple-black: fore wings with the orbicular and reniform as in *I. manlia* ♀, the black portion of the wing limited by a straight pale thin band with black outer edges; outer portion of wing brown, thickly irrorated with white atoms, except in a small portion of the wing, where the absence of irroration leaves a black apex and black waved band below it; outer margin with pure white points: hind wings blackish brown; a very large central white patch, nearly round, and below it there are white irrorations to the outer margin near the anal angle. Underside blackish brown, the white central bands as in *manlia*, but much broader; a white suffused space inside the band of fore wings.

Expanse of wings $4\frac{4}{10}$ inches.

Solomon Islands (*Ribbe*).

Allied to *I. neorherina*, Butler, from New Britain. It is such a handsome distinct species, though a female only is in my possession, I am tempted to describe and name it.

Ischyja inferna, ♂.

Above as in *I. manlia*, Cram.; the blue band in the hind wings is not contracted in its middle as in that species and is attenuated hindwards, but otherwise it is very similar; the underside, however, is very different, the colour is brownish grey, the discal band of fore wings is broader, and the hind wings are white, with broad brownish-grey borders and central irregular grey line as in *I. Anna.*

Expanse of wings $3\frac{2}{10}$ inches.

Kina Balu, N. Borneo (*Waterstradt*).

It is well separated from *I. Hageni*, Snellen, and *I. Anna*, because the transverse black line or band on fore wings above is differently placed. There are four males in the B. M. from Sandakan. It is no doubt a local form of *I. manlia.*

Ischyja dispar, nov.

♂. Upperside like *I. Anna*, but the discal blue band on the hind wings above is broader, shorter, and more round; the palpi are brown, as in *I. manlia* and *I. Hageni*, Snellen, and not pure white beneath as in *I. Anna*; the mark in the inner disk is five-sided, in one example nearly round, but the sides are smooth and not irregularly sinuous as in *I. Hageni*; the orbicular is also round and very small. On the underside the colour is brownish grey, the band on fore wings is broader than usual in the genus, and the hind wings are entirely white, with a very faint indication of a sinuous central grey line and a little grey suffusion on the margins.

Expanse of wings $3\frac{3}{10}$ inches.

Lombok Island (*Everett*).

Family **Deltoididæ.**

Zethes cauxa, nov.

♂ ♀. Greyish ochreous, irrorated with minute brown atoms; thorax brown: fore wings with white linear-shaped orbicular and reniform marks: hind wings with a white linear spot at the end of the cell; both wings with the outer half brown, the division sharply and regularly defined; an indistinct sinuous submarginal line; a more or less distinct ochreous patch on the outer margin of fore wings immediately below the apex, in some examples this is very distinct, in others it is nearly obsolescent. The underside is clearer ochreous, with the markings showing through somewhat: fore wings with a small black patch in the cell, another on the middle of the outer margin, a subapical black dot; hind wings with a black diffuse subbasal band, a similar discal band, and a black patch on the middle of outer margin.

Expanse of wings 1 inch.

Kina Balu, N. Borneo (*Waterstradt*).

There are four examples in the B. M., unnamed, from Mount Marapok, N. Borneo, in Deltoid drawer no. 36.

Zethes salsoma, nov.

♂ ♀. Dull ochreous grey, irrorated with minute dark grey atoms: fore wings with subbasal, antemedial, and medial, outwardly curved, dark grey sinuous thin bands, the last running through the dark grey lunule at the end of the cell; both wings crossed by a discal, irregular, and more or less dentated dark grey outwardly curved line, which meets the third band of fore wings at the hinder margin; the outer portion of both wings suffused with brown, containing a submarginal row of white lunular spots, from which proceed two or three ochreous-white streaks towards the margin, opposite the angle above the middle. Underside pale ochreous grey, irrorated with brown atoms, the outer third suffused with brown, containing three brown crenulated discal lines close together and submarginal white lunular spots.

Expanse of wings 2 inches.

Kina Balu, N. Borneo (*Waterstradt*).

The outer margin is excavated below apex of fore wings and angled in both wings. There are two examples unnamed in the B. M. from Bhamo, Burma, and Brunnei, Borneo, Quadrifid drawer, no. 211.

Zethes chilana, nov.

♂ ♀. Olive-brown, with a slight purplish tinge: fore wings with a black lunule with a pale centre at the end of the cell; some ochreous dots on the costa towards apex; both wings with interior medial and discal, rather indistinct, brown, sinuous, transverse lines, the last expanding into deep black patches above the hinder margin on fore wings and in the middle on the hind wings, and rather close in places to the middle line; an indistinct pale sinuous submarginal line, black lunulated marginal line, and ochreous lunules in the interlined brown cilia, opposite the vein-points. On the underside there is a black subapical spot on fore wings, the transverse lines are more distinct, and the wing is somewhat marbled and variegated with brown patches and shades.

Expanse of wings 1½ inch.

Kina Balu, N. Borneo (*Waterstradt*).

The underside is almost similar to that of *Z. vaga*, Walker, but all this group of *Zethes* much resemble each other on the underside.

Bleptina inconspicua, nov.

♂ ♀. Of a uniform dark grey above, the orbicular a small white dot, the reniform white, large, and oblique: fore wings with three very sinuous, partly dentated and outwardly curved pale lines, white on and near the costa, antemedial, postmedial, and submarginal: hind wings with two indistinct similar lines, discal and submarginal, marginal brown lunules to both wings, pale marginal line and grey cilia. Underside: fore wings grey; hind wings nearly white with grey outer border; fore wings with the costa with white dots, both wings with brown cell-spots and discal and submarginal grey sinuous lines.

Expanse of wings 1$\frac{2}{10}$ inch.

Kina Balu, N. Borneo (*Waterstradt*).

There is a female from Sandakan in the B. M., unnamed, in Deltoid drawer no. 34.

Bleptina erectilinea, nov.

♀. Olive-brown, tinged with ochreous, with chocolate-brown markings, transverse lines duplex with pale centres, first close to the base, second antemedial, both slightly outwardly curved and sinuous, a small white dot ringed with brown, as orbicular, just outside the second line, third line erect, very nearly straight, a square-shaped white reniform edged with brown, close on its inner side, a submarginal very sinuous line, the space between the two lines purplish brown, as is also the apex and a small space in the centre of the outer margin: hind wings brown, with indistinct sinuous pale lines central and submarginal; both wings with black marginal lunules, pale marginal line, and pale cilia with a brown base. Underside paler, with black cell-spots and discal and submarginal sinuous transverse black lines.

Expanse of wings $1\frac{1}{10}$ inch.

Kina Balu, N. Borneo (*Waterstradt*); two examples.

This species somewhat resembles *B. dentilinea*, Hmpsn., from Sikkim, which I have also from the Khasia Hills.

Bleptina carta, nov.

♂. Fawn-colour, irrorated with minute brown atoms: fore wings crossed by three straight brown lines, antemedial and medial, erect and parallel, the third runs from the apex to the hinder margin near the angle, between the last two lines is a thin somewhat sinuated and indistinct brown line; on the hind wing there is a straight discal line corresponding to the outer line of the fore wings, which is cut short by a brown suffused space below the apex, this suffusion extends more or less along the costa and on the inner portions of the wing, marginal line black, lunular; cilia ochreous.

Expanse of wings $1\frac{2}{10}$ inch.

Kina Balu, N. Borneo (*Waterstradt*).

There is a female in the B. M. from Pulo Laut, unnamed, in the Deltoid drawer no. 34.

Bleptina pulla, nov.

♂. Of a uniform dull olive-brown colour, a prominent black lunule at the end of the cell of fore wings, a pale line with brown edges across the disk of both wings, nearly straight and erect in fore wings, outwardly curved on hind wings, indications of a sinuous submarginal line, marginal lunules black; cilia with a pale base. Underside of a dull pale greyish brown, a brown lunule at the end of each cell, a transverse grey thin band pale on its outer edge, across both wings, discal and erect on fore wings, medial and outwardly curved on hind wings.

Expanse of wings $1\frac{1}{2}$ inch.

Kina Balu, N. Borneo (*Waterstradt*).

The third joint of the palpus is short and thick, and both second and third joints have long thick hair on the upperside; the antennæ have short bristles on each side.

Asthala sphærula, nov.

♂ ♀. Of a uniform dark chocolate-brown; the orbicular a white dot; the reniform a white ring nearly round with a brown centre: fore wings with the transverse lines duplex and sinuous, with dull ochreous centres, first antemedial before the orbicular, the second discal, beyond the reniform, the third submarginal: hind wings with indications of discal and submarginal lines towards the anal angle; both wings with black marginal lunules and pale marginal line. Underside grey, with brown cell-spots and discal submarginal brown sinuous lines.

Expanse of wings $1\frac{3}{10}$ inch.

Kina Balu, N. Borneo (*Waterstradt*).

Marked above and below somewhat similarly to *Asthala silenusalis*, Walker, of which I have received a long series from the same locality, but the wings are shorter; the one-sided pectinations of the antennæ are so minute, it requires a strong glass to see them at all; the reniform is round instead of being ear-shaped, and the underside is differently coloured, and the bands are closer together.

Adrapsa Editha, nov.

♂ ♀. Of a uniform purple-brown; a white prominent lunule at the end of cell in male only: both wings crossed by three sinuous blackish-brown bands, antemedial, medial, and discal, the second band extending only from the cell lunule to the hinder margin and nearly straight, the third band with a curve outwards in its middle, a submarginal sinuous pale band, a black marginal lunular line, and white marks in the cilia at the vein ends. Underside greyish, with the bands as above, but prominent and distinct.

Expanse of wings $1\frac{8}{10}$ inch.

Kina Balu, N. Borneo (*Waterstradt*).

Three males and twelve females. The antennæ are as in the subgenus *Asthala*, Moore, but the shape of the wings is very different to that of *silenusalis*, Walker, being long and somewhat narrow.

Adrapsa thermesia, nov.

♂ ♀. Of a uniform dark olive-brown: fore wings with a large prominent black spot at the end of the cell, a large ochreous square patch on the outer margin at the apex, a brown smear on the costa within the patch; antemedial and postmedial outwardly recurved sinuous dark brown lines, the former inwardly and the latter outwardly edged with ochreous: hind wing with a similar medial line; both wings with indistinct sinuous ochreous submarginal line, black marginal line, and ochreous lunules in the black cilia opposite the vein ends. Underside paler, lines similar but very distinct, and all three complete in both wings; a black spot with ochreous centre at the end of each cell, and a black apical patch in the ochreous square at apex of fore wings.

Expanse of wings 1½ inch.

Kina Balu, N. Borneo (*Waterstradt*).

A long series. The male has an ochreous anal tuft; the antennæ are waved, but have no distortion, and are unipectinate with long spines and cilia; it much resembles *Oneratha ereboides*, Walker, but the antennæ and palpi are quite different.

Oxænanus marmorea, nov.

♀. Black, very uniform in colour: fore wings with a white lunular streak at end of cell, and three transverse white lines, first before the middle, second discal, both slightly sinuous and outwardly curved; third line submarginal, connected with the outer margin by a white subapical spot, with the apical space in one specimen smeared with white, in the type specimen with four duplex white spots on the fringe below the apex: hind wings with only two outer lines, corresponding to those on the fore wings, the inner one being medial: both wings with the marginal line dark black; cilia paler black, with a basal pale line. Underside blackish brown, a white lunule at the end of each cell; outer lines and apical marks as above, and a general variegated and marbled appearance on both wings.

Expanse of wings 1$\frac{6}{10}$ inch.

Kina Balu, N. Borneo (*Waterstradt*).

Two examples.

LXX.—*Some Points in the Morphology and Classification of the* Opiliones. By R. I. Pocock.

[Plates IX. & X.]

Part I.—The Classification of the *Plagiostethi.*

In 1873 Sörensen (Nat. Tidskr. (3) viii. pp. 514–515) classified the Opilionides into two tribes—Opilionini for the typical genera, and Trogulini for *Ischyropsalis*, *Nemastoma*, *Dicranolasma*, *Trogulus*, and allied forms. From this classification it may be inferred that in the opinion of its author *Ischyropsalis* is more nearly related to *Nemastoma* and *Trogulus* than to the Phalangiine Opiliones, or Opilionini genuini as Sörensen called them. Subsequent authors have apparently been unable to divest themselves wholly of this view of the matter.

Three years later Thorell proposed the following classification (Ann. Mus. Genov. viii. pp. 462–469, 1876):—

Fam. I. Phalangioidæ.
    Phalangium &c. and *Sclerosoma*.

Fam. II. Nemastomoidæ.
    Subfam. 1. Nemastomini.
        A.—*a. Ischyropsalis.*
            b. Nemastoma.
        B. *Dicranolasma.*
    Subfam. 2. Trogulini.
        Trogulus and *Anelasma.*

This classification, an expansion of Sörensen's, involves the supposition on Thorell's part that *Ischyropsalis* is more nearly related to *Trogulus* than to *Phalangium*, since the two forms are classified together in a group equal to the group containing *Phalangium* and its allies. The association, moreover, of *Ischyropsalis* with *Dicranolasma* in one subfamily, contrasted with another containing *Trogulus*, attests the belief that *Dicranolasma* is more nearly allied to *Ischyropsalis* than it is to *Trogulus*.

Both these conceptions are unquestionably erroneous.

Simon, in 1879 ('Arachnides de France,' vii.), in an excellent treatise on the Opiliones of France, with stray notes upon exotic forms, proposed the following taxonomy of the genera:—

Fam. PHALANGIIDÆ.
    Subfam. 1. Sclerosomatinæ.
        Sclerosoma &c.
    Subfam. 2. Phalangiinæ.
        Phalangium &c.

Fam. ISCHYROPSALIDÆ.
        Ischyropsalis &c.

Fam. NEMASTOMATIDÆ.
        Nemastoma.

Fam. TROGULIDÆ.
    Subfam. Dicranolasmatinæ.
        Dicranolasma, Amopaum.
    Subfam. Trogulinæ.
        Trogulus, Anelasmocephalus.

This classification, which was followed in the main by Hansen (Nat. Tidskr. 1884), by Sörensen (Nat. Tidskr. 1884, Term. füzetek, xvii. 1894), Kraepelin (Mitth. Mus. Hamb. xiii. 1896), Becker (Arach. Belg.), and O. P. Cambridge (P. Dorset Field-Club, xi. 1890), is more in accord with the facts; but I do not think the arrangement of the genera into four equivalent sections fully expresses their true relationships. Moreover, in the key to the determination of these families, they are grouped under two primary headings, the first containing the Phalangiidæ, and the second the Ischyropsalidæ, Nemastomatidæ, and Trogulidæ, a method which suggests a covert adherence to the views of affinity originally promulgated by Sörensen.

That the Palpatores or Plagiostethous Opiliones fall into the four families instituted by Simon is thus generally admitted, but that these families are naturally groupable into the two sections which are also usually adopted is, I am persuaded, an erroneous view. They fall into two groups, it is true, but the line of division comes, not between the Phalangiidæ and Ischyropsalidæ, but between the Ischyropsalidæ and Nemastomidæ, *Ischyropsalis* being far more nearly related to *Phalangium* than to *Nemastoma*.

This proposition, so contrary to what is usually accepted, may be easily justified.

The sternal surface of the prosoma in the Phalangiidæ is furnished with a relatively large, usually longitudinally oblong, anterior plate or *labium*, which underlies and is partially united to the maxillary processes of the legs of the first pair. Behind, with its free anterior edge overlapping the posterior border of the labium, lies a second sternal plate, which is shorter and wider than the first, with its long axis transverse and its posterior border straight or nearly so. Jutting inwards on each side from the proximal end of the coxa of the second leg is a movable maxillary sclerite, which underlies and supports the labium, and the proximal end of the coxa of the fourth leg projects forwards on the admedian side of that of the preceding coxa, partially excluding it from approaching the middle line of the sternal area. (Pl. IX. fig. 1 A.)

In the structure of its two sternal plates *Ischyropsalis* resembles the Phalangiidæ, as also in the forward prolongation of the proximal end of the coxa of the last leg. The chief difference between the two, so far as the structures in question are concerned, lies in the fact that the maxillary process of the coxa of the second leg is shorter and directed vertically downwards *. (Pl. IX. fig. 1 B.)

In *Nemastoma*, *Dicranolasma*, *Trogulus*, and *Metopoctea*, on the contrary, the labium is small, cordate or piriform, or almost suppressed, and is lodged between the maxillary processes of the legs of the first pair; its posterior border is continuous with and flexibly fixed to the anterior end of the sternum, and the sternum itself lies longitudinally, immovably wedged between the coxæ, narrowed in front between those of the first pair of legs and expanding posteriorly into a triangular plate or a right and left branch, forming a λ-shaped sclerite. Moreover, there is no maxillary process on the coxa of the second pair of legs, and the coxa of the fourth leg does not send forward a process on the proximal side of that of the third leg. (Pl. IX. figs. 2, 3 A, and Pl. X. fig. 3 B.)

I have been able to examine the sternum only in the genera mentioned above. No doubt, however, a similar arrangement will be found in the other genera of Trogulidæ †.

There is, then, a radical difference between the sternal sclerites of the Phalangiidæ and Ischyropsalidæ on the one hand, and of the Nemastomidæ and Trogulidæ on the other, enabling us to classify these four families into two groups. These I propose to call Apagosterni and Eupagosterni *.

---

* As characters serving to distinguish *Ischyropsalis* from the Phalangiidæ the fixity and smallness of the maxillary lobe of the second pair of legs and the immobility of the coxæ of the legs have often been urged. But neither the maxillary process nor the coxæ are fixed; they are movable, as may be easily demonstrated by holding a specimen of *Ischyropsalis* under the microscope and manipulating the parts in question with a needle. They are not so movable as in the Phalangiidæ certainly, but equally certainly the coxæ are not fixed, as are those of *Gonyleptes* or *Trogulus*, nor is the maxillary process fixed in the sense that the ocular tubercle is fixed.

† In his diagnosis of *Amopaum* Simon, in 1879, says "*pièce labiale plane et large*"; yet Sörensen, in 1884, enumerates amongst the characters distinctive of the Nemastomoidæ and Troguloidæ, including *Amopaum*, "*labium sternale minutum.*" I am unable to reconcile these statements.

In none of the systematic works quoted above have I found the sterna of the Nemastomidæ and Trogulidæ described.

In speaking of the sternum of the Opiliones in general, Simon confined his remarks, so far as the Plagiostethi (Palpatores) are concerned, to the Phalangiidæ (*loc. cit.* p. 121). Had he examined the sternum in *Trogulus*, *Nemastoma*, and *Dicranolasma*, he would hardly have described this plate as "très-court, transverse" (p. 157) in the Plagiostethi. In short, his account of the Plagiostethi contains no statement of the structural differences pointed out above.

Thorell, on the other hand, appears to have searched for the sternum at least in *Trogulus*, but with what measure of success may be gathered from his statement that in this genus two small oblique laminæ, meeting at an angle in front and united to the base of the coxæ of the first pair of legs, seem to take the place of the sternum and labium (p. 468, 1876). These "oblique laminæ" are the thickened and elevated edges of the coxæ in question.

In the present year (Zool. Anz. xxv. p. 445) Börner writes:—"Auch bei *Trogulus tricarinatus* fand ich keine Unterlippe, aber ebenfalls kein eigentliches Sternum; die Chitinhaut zwischen den Hüften der 4 letzten Beinpaare ist nur schwach und gleichmässig chitinisiert und kaum als Sternum aufzufassen; hier schliessen die Coxalfortsätze der 3 Extremität den Mund hinten ab. Bei *Nemastoma* findet man ein kleines Sternum zwischen den Hüften der 3 Extremität, hinter den Coxalfortsätzen; es ist ohne labiale Function, die von den Kauladen der 3 Extremität ausgeübt wird; andere sterna fehlen hier. . . . Da der Genitaldeckel . . . zwischen den Hüften . . . des letzten Beinpaare (*Trogulus*, *Nemastoma*, Phalangidæ etc.) liegt . . . fehlen bei den Opiliones meist das Tetra-, Penta- . . . und Metasternum" [= sternal plates of the somites of the prosoma]. And in the table (p. 439) showing the persistence and suppression of the sternal plates in various genera of Arachnida the sterna of the third and fourth somites [*i. e.*, represented by the first and second pairs of legs] in *Trogulus* are bracketed as "schwach chitinisiert," those of the fifth and sixth as replaced by the genital plate; in *Nemastoma* that of the third [*i. e.*, the *labium*] is indicated as present, those of the fourth, fifth, and sixth bracketed as replaced by the genital plate.

---

* *ἀπαγής*, loosely knit or unfixed; *εὐπαγής*, well fixed or firmly knit; and *στέρνον*, the breast.

I cannot agree with this interpretation of the facts. It appears to me that in all Opiliones, including the Anepignathi (*Leptopsalis* &c.), the sternal sclerite that lies behind the labium represents the sternal elements of the posterior four somites of the prosoma, and is strictly homologous throughout the order.

In addition to the features mentioned above, *Ischyropsalis* differs from *Nemastoma* and the Trogúloid genera, and resembles the Phalangiinæ, in the separation of the carapace from the tergites of the opisthosoma, the presence of a deep transverse groove on the posterior portion of this plate, the exposure of the apertures of Krohn's glands, the suppression of the anal sternite, the absence of lateral anal valves, and the dentition of the digits of the cheliceræ. The large size of the chelicerae even is a character shared by such genera of Phalangiinæ as *Rhampsinitus* and *Pantopsalis*. Added to all these features is the presence of a movable styliform process at the extremity of the penis—a character which Simon pointed out as distinctive of the Phalangiidæ, although he was not able to test the supposed absence of this structure in *Ischyropsalis*. In fact, in almost all its characters, except the shortness of the terminal segment of the palpus, the suppression of the palpal claw, the absence of tibial spiracles, and the direction of the maxillary process of the second pair of legs, *Ischyropsalis* is essentially Phalangiine in structure. These four characters justify the formation of a separate family for *Ischyropsalis* and its allied form *Sabacon*, which is unknown to me; but when balanced in the scale against the many deep-seated characteristics separating this family from the Nemastomidæ, its next of kin amongst the Eupagosternous genera, they have but little weight.

One other small point connected with the affinities of *Dicranolasma* remains to be mentioned. This genus was placed nearer to *Nemastoma* than to *Trogulus* by Thorell and nearer to *Trogulus* than to *Nemastoma* by Simon. So far as the facts dealt with by the two authors were concerned, Thorell's view appears to me to be the more correct; of the two, Simon relied solely upon the presence of the frontal processes in classing the genus with *Trogulus*, whereas in the structure of the appendages, of the sternites of the opisthosoma, and of the last two tergites the affinities are very decidedly more Nemastomine than Troguline. The sternal plates of the prosoma are, however, more like those of *Trogulus* than of *Nemastoma*. Perhaps, therefore, the most satisfactory method of dealing with *Dicranolasma* is to regard it as the type of a special family.

The Palpatores or Plagiostethous Opiliones may be classified then as follows :—

a. Anterior sternal plate (*labium*) small, wedged in between the sterno-coxal or maxillary processes of the appendages of the third pair (first pair of legs); posterior sternal plate with its long axis longitudinal, narrow in front, where it lies between the coxæ of the appendages of the third pair, expanding posteriorly and sending out a right and left process, against which the coxæ of the fifth and sixth appendages (third and fourth legs) abut, its posterior border being strongly or moderately emarginate; the proximal end of the coxæ of the sixth appendage narrowed and not overlapping that of the fifth towards the middle line; coxa of the fourth appendage without a movable sterno-coxal process. Dentition of digits of chelicerae evenly serrulate. Penis of male without movable terminal sclerite beyond the orifice (sec. Simon) .... **Eupagosterni.**

a^1. Sternites of opisthosoma free, overlapping, without median divisional sulcus; first and second (genital and tracheal) narrowed anteriorly and conically produced between the coxæ of the prosoma, and only overlapping the posterior two pairs to a relatively small extent; eighth or penultimate tergite large, greatly expanded laterally, the ninth or anal considerably larger than the anal sternite and than the lateral anal valves; labrum elevated, subacute; legs longish, with protarsi distally slender, not wider than the tarsi, which are multiarticulated.

a^2. Ocular tubercle normal, bearing the two eyes and situated a little distance behind the anterior border of the carapace; sternum thickly chitinized, inversely Y-shaped .... Fam. NEMASTOMIDÆ.

b^2. Ocular tubercle absent, its place taken by a pair of horizontally arched frontal processes, bearing the eyes near the middle of their length and overhanging the chelicerae; sternum less strongly chitinized, very narrow in front, broadly triangular behind .... Fam. DICRANOLASMIDÆ.

b^1. Sternites of opisthosoma, except the genital and anal, fused, not overlapping, and marked by a median longitudinal sulcus; first and second (genital and tracheal) widely rounded anteriorly and considerably overlapping the proximal extremities of the two posterior pairs of coxæ; eighth or penultimate tergite small and narrow, not expanded laterally; the ninth or anal subequal in size to the anal sternite and lateral valves; labrum flat; legs shorter and stouter, with protarsi distally broader than the tarsi, which are pauciarticulated; carapace with frontal processes concealing the appendages of the first two pairs; sternum as in *Dicranolasma*, but with the posterior expanded portion shorter and wider .... Fam. TROGULIDÆ.

b. Anterior sternal plate (*labium*) large, subquadrate, as long as or longer than the posterior sternal plate and underlying the sterno-coxal or maxillary processes of the appendages of the third pair (first pair of legs); posterior sternal plate with its long axis transverse, at least twice as wide as long, its posterior border straight, not emarginate; proximal end of the coxæ of the sixth appendages sending forwards a process on the proximal or inner side of those of the preceding appendages; coxæ of fourth pair (second leg) with distinct and movable sterno-coxal (maxillary) process. Dentition of digits of chelicerae uneven, lobate. Penis of male with movable terminal style .... **Apagosterni.**

a^3. Terminal segment of palpus shorter than the penultimate and clawless; postero-inferior edge of the coxæ of the appendages of the last pair not fused with the adjacent sternal plate of the opisthosoma; maxillary process of second leg directed vertically downwards; no tibial spiracles............ Fam. ISCHYROPSALIDÆ.

b^3. Terminal segment of palpus much longer than the penultimate and armed with a small claw; coxa of sixth appendage united near its base on the posterior side to the tracheal sternite of the opisthosoma; maxillary process of second leg directed horizontally inwards; tibial spiracles present ...... Fam. PHALANGIIDÆ.

a^4. Carapace not fused with the anterior five tergites of the opisthosoma; apertures of Krohn's glands exposed . Subfam. *Phalangiinæ.*

b^4. Carapace and anterior five tergites of opisthosoma fused into a single dorsal shield; apertures of Krohn's glands concealed .... Subfam. *Sclerosominæ.*

Part II.—THE POSITION AND CLASSIFICATION OF THE *INSIDIATORES.*

Up to 1900 there was a tacitly admitted or openly expressed agreement that the Opiliones, apart from the Anepignathi or Cyphophthalmi, fall into two nicely balanced groups—the Palpatores or Plagiostethi and the Laniatores or Mecostethi. In the year named this arrangement was disturbed by Dr. J. C. C. Loman (Zool. Jahrb., Syst. xiii. p. 80), who proposed the suborder Insidiatores for the family Triænonychidæ of Sörensen—a family resembling the Laniatores in all essential characters except the presence of a single claw on the tarsi of the fifth and sixth pairs of appendages, as in the Palpatores. The characters in which the Palpatores differ from the Laniatores are numerous and have been pointed out by Thorell, Simon, and especially Sörensen. In Loman's opinion the systematic value assignable to the claws is equal to that of all the other structural characters combined. In the present year (Zool. Jahrb. xvi. pp. 170–171) he tabulates the characters of the three suborders, and adds to his earlier diagnosis of the Insidiatores two additional features in which they resemble the Palpatores and differ from the Laniatores—namely, the presence of two receptacula seminis in the female and of an erectile muscle for the glans of the penis in the male. Judging, however, from his tabulation of the characters, the Insidiatores are at one with the Laniatores in the segmentation of the opisthosoma, the structure of the palpi, of the coxæ of the appendages, and of the sternum of the prosoma, in the wide distance between the mouth and genital orifice, in the number of the saccular diverticula of the alimentary canal, the structure of the lubricating-glands of the penis, and the structure of the ovipositor.

It appears to me that a greater value must be assigned to these many points of resemblance than to the three points of difference above alluded to, and that the Triænonychidæ or Insidiatores must still be classified with the Laniatores in a group equivalent to the Palpatores. Nevertheless it is evident that they differ from the remaining families of Laniatores in characters of greater importance than those used to distinguish these said families from each other. Hence it is perhaps advisable to accept the Insidiatores as a group equivalent to the Laniatores, and to classify them together under the Mecostethi. I propose therefore the following classification of the Opiliones:—

A. PLAGIOSTETHI (= Palpatores).
  a. Apagosterni.
  b. Eupagosterni.

B. MECOSTETHI.
  a. Insidiatores.
  b. Laniatores.

C. CYPHOPHTHALMI (= Anepignathi *).

The characters separating the Apagosterni and Eupagosterni, however, are of much higher value, in my opinion, than those separating the Insidiatores and Laniatores. The sternal plate of the prosoma in the Laniatores shows great constancy in shape as compared with that of the Insidiatores. The Laniatores are divided into several families, in all of which the sternum exhibits but little variation from the normal characteristic of the Mecostethi. It seems logical, therefore, to conclude that when striking variations from this type are met with in the Insidiatores, such variations, if constant, should form the basis for the establishment of groups of "family" rank. I propose consequently to divide the Insidiatores, which by Sörensen and Loman are considered to be represented by the single family Triænonychidæ, into the following groups of this rank, postulating that the structural features on which they rest have at least the same value as those used for the same purpose in the Laniatores:—

a. Sternum very narrow and compressed between the coxæ of the appendages of the fifth pair, abruptly expanding between those of the sixth, and showing a lanceolate or narrowly cordate expansion opposite the line of junction of the coxæ of the fourth and fifth pairs of appendages.
  *a*¹. Posterior expansion of sternum narrow, subpentagonal, not wider than long, much narrower than the length of the area between the fifth appendages; stigmata exposed ...... Fam. TRIÆNONYCHIDÆ.
  *b*¹. Posterior expansion of sternum transversely arcuate, laterally pointed, much wider than long, much wider than the length of the narrow area lying between the coxæ of the fifth appendages; stigmata concealed .... Fam. TRIÆNOBUNIDÆ, nov.

---

* This name is of later date than Cyphophthalmi, and was upon a misconception.

b. Sternum not narrow and compressed between the coxæ of the fifth appendages, wider at this point than in front, either narrowly triangular and gradually expanding from before backwards between the coxæ of the fifth appendages or narrowly pentagonal and somewhat abruptly expanding between them; stigmata concealed .... Fam. Adæidæ, nov.

The Insidiatores are confined to the southern portion of the Great Continents. The Triænonychidæ contain the genera *Acumontia* from Madagascar; *Diasia* from Chili; *Triænonyx* from Chili, New Zealand, Australia, and Fiji; *Nuncia*, which is hardly separable generically from *Triænonyx*, from New Zealand; and two new genera to be shortly described, one from New Zealand, the other from Tasmania.

The characters of the Triænobunidæ are taken from a specimen belonging to a Tasmanian species in the British Museum which I refer to *Triænobunus*. The type of the latter was from Queensland.

The Adæidæ are represented by two genera. *Adæum*, of which the British Museum has examples, is confined to S. Africa and New Zealand.

The genus *Larifuga*, to which belongs *P. rugosum*, Guér., of which the type is in the British Museum, is also S. African.

Part III.—Further Notes on the Sterna and on the Segmentation of the Abdomen.

In the paper already quoted Börner states that, on account of the forward projection of the genital plate between the coxæ of the appendages of the sixth pair in *Leptopsalis* and *Pachylus* and the encroachment of the coxæ of the fourth and fifth pairs towards the middle line in the members of the group—the Mecostethi—to which *Pachylus* belongs, the sternites of the fourth, fifth, and sixth somites of the prosoma

fourth and fifth somites are indicated as absent in *Pachylus* and that of the sixth as replaced by the genital plate.

It is difficult to reconcile this opinion with the known facts. In the Mecostethi (including *Pachylus*) the sternal plates of the fourth, fifth, and sixth somites of the prosoma are represented by a firmly chitinized, narrow, unsegmented, longitudinal plate lying between the coxæ of the fourth and fifth pairs of appendages and abutting against the inner angles of those of the sixth in front of the generative orifice, where it is slightly (*Gonyleptes*) or considerably (*Adæum*) expanded *. This expanded portion is overlapped by the genital plate, and frequently the maxillary processes of the fourth pair overlie its anterior portion in the middle line (Oncopodidæ, Triænonychidæ, Biantidæ, &c.), although it is uncovered in the Gonyleptidæ and Cosmetidæ.

Börner has also, I think, misinterpreted the sterna of the opisthosoma in *Trogulus*. The large plate following the genital operculum is numbered 4 and the following plate 5 (fig. 11, p. 443), and it is to be inferred that these plates correspond to those numbered 4 and 5 in the figures of *Leptopsalis* and *Pachylus*, the fourth being that which bears the stigmata and the fifth the next following. But in *Pachylus* and, I believe, all Laniatores and most Palpatores, except some Phalangiidæ (e. g., *Sclerosoma*), the sterna Börner has designated 4 and 5 in the case of *Pachylus* are united to form a single plate, the line of demarcation being represented by a shallower or deeper groove or scarcely at all traceable. In *Trogulus* the divisional line is, I think, quite obliterated. If so, the sternal plate marked 4 by Börner for this genus should have been marked 4+5 to bring it into harmony with those of *Pachylus*, and the sternum marked 5 should be 6. This method of enumeration arrives at numerical similarity in the sternal plates in the two genera, instead of leaving *Trogulus* with one plate short. *Trogulus* is an exceedingly specialized genus, and the key to its morphology is to be found in its less specialized allies *Dicranolasma* and *Nemastoma*. Both these genera have the same number of sternal plates as *Pachylus*, namely, seven, including the genital and the anal, and the second is marked by a transverse impression, as in *Pachylus* and many other genera of Laniatores, indicating its primitive double origin. I think there can be no reason to doubt that this transversely impressed second plate in *Dicranolasma* is the homologue of the unimpressed second plate in *Trogulus*.

In the Laniatores and Palpatores eight sternal plates are to be traced with certainty. The first is the genital, the second the tracheal, and the eighth the anal. In all Laniatores the second and third are fused, though the line between the two is very deep and strong in some forms (e. g., *Biantes*).

---

* In the article "Arachnida" in the supplementary issue of the Encycl. Britannica, p. 544 (1902), under the heading Laniatores the insertion of the words "of the fifth pair" was an error which was overlooked in the correction of the proof. Also under the family Cryptostemmidæ (p. 543), for *Anthracomartus* read *Poliochera*.

In the Eupagosternous Palpatores the divisional line between the second and third is feebly (*Dicranolasma*) or not at all (*Trogulus*) marked, and the eighth is small.

In all the Apagosternous Palpatores, except *Taracus* belonging to the Ischyropsalidæ, the eighth is suppressed, the anal tergite closing against the posterior border of the seventh. Similarly in all the members of this group the first or genital is not or scarcely differentiated from the second, and only in some cases (e. g., *Sclerosoma*) is there a deep groove between the second and third. Hence in the Phalangioid Palpatores the number of sternites may be reduced to six, (1) by the suppression of the eighth (anal) and fusion of the first (genital) with the second (tracheal) in *Sclerosoma*; (2) by the fusion of the first, second, and third into a single plate in *Taracus*, or even to five by the fusion of the first, second, and third, and the suppression of the eighth, as in most Phalangiinæ.

Finally, in many genera of Laniatores the eighth shows indications of being composed of two sternites, which would bring the total number of sternites up to nine, thus equalling the tergites in number and agreeing precisely with the number of sternites found in the young of *Pettalus* and the adults of the species of *Stylocellus* (*Leptopsalis*) amongst the Anepignathi (Cyphophthalmi), the third suborder into which the existing Opiliones fall, and also with the numbers found in the genera of the Carboniferous Anthracomarti, as I have recently shown (Geol. Mag. 1902, Oct. and Nov.).

EXPLANATION OF PLATES IX. & X.

Fig. 1. The ventral surface of the prosoma of a species of *Gayrella* (1 A), one of the Phalangiidæ, and of *Ischyropsalis* (1 B), one of the Ischyropsalidæ, with the genital prolongation of the opisthosoma removed, to illustrate the structure of the sternal plates &c. in the Apagosterni. II–VI, basal segments of the appendages from the second to the sixth pairs; *mx.* 2, *mx.* 3, *mx.* 4, maxillary processes of the second, third, and fourth appendages; *st.* 1, anterior sternal plate or labium; *st.* 2, posterior sternal plate, the so-called sternum proper; *mb.*, membrane forming the roof of the genital canal, representing, perhaps, the sternal area of the genital somite.

Fig. 2. Ventral surface of the prosoma of a species of *Nemastoma*, one of the Eupagosterni, with the genital prolongation of the opisthosoma removed. I–VI, basal segments of the appendages; *lr.*, labrum; *mx.* 2, *mx.* 3, maxillary processes of second and third pairs of appendages; *st.*, sternal plate attached anteriorly to the piriform labium; *mb.*, membrane forming the roof of the genital canal, and representing, perhaps, the sternal area of the genital somite.

Fig. 3. Ventral surface of the prosoma of a species of *Dicranolasma* (3 A) and of *Trogulus* (3 B), two of the Eupagosterni, with the genital prolongation of the opisthosoma removed. The lettering as in fig. 2. (For the sake of clearness the distinctness of the labium in these figures is exaggerated.)

Fig. 4. Median portion of ventral surface of prosoma of a species of *Adæum* (A) and of *Triænobunus* (B), with the genital plate of the opisthosoma removed. III-VI, coxæ of the third to the sixth appendages; *lb.*, labial portion of sternum; *mx.* 3, *mx.* 4, maxillary processes of third and fourth pairs of appendages; *st.*, sternum overlapped in front by the coxæ of the fourth appendage on each side; *mb*, membrane in front of the genital orifice (*g*), representing, perhaps, the sternal area of the genital somite. C. Sternum of *Larifuga* (after Loman).

Fig. 5. Median portion of ventral surface of prosoma of a species of *Acumontia* (A), one of the Triænonychidæ, and of a species of Gonyleptidæ (B). Lettering as in fig. 4.

LXXI.—*On the Mole of the Roman District.*

By Oldfield Thomas.

The British Museum owes to the kindness of Dr. L. Sambon two moles obtained by him during the important malaria experiments carried out by him during the summer of 1900.

An examination of the skulls of these specimens shows that they differ widely both from the common European mole (*Talpa europæa*) and Savi's mole (*Talpa cæca*) by the very much greater size of their teeth and certain other cranial characters, and are clearly separable specifically. *Talpa cæca* has, if anything, even smaller teeth than *T. europæa.*

Talpa romana, sp. n.

Colour and proportions about as in *T. europæa*; orbits apparently covered by skin, but this is not absolutely determinable.

Skull of about the same length as that of *T. europæa*, but somewhat more heavily built; zygomata thicker and perceptibly longer, their hinder end starting from the brain-case nearer its external angles and nearly or quite above the anterior part of the meatus instead of wholly in front of it; lacrymal foramina markedly larger than usual.

Teeth, and especially molars, conspicuously larger throughout; upper incisors broad, closely touching one another, the median pair larger in proportion to the others than in the common mole; molars much larger and heavier in every direction, broader, with larger internal lobes, higher and longer than in any other European form. The combined length of

the three upper molars is 7·5 millim. as compared with 6·2 in *T. europæa*, and of the lower 8·1 as against 6·8; the breadth of m^2 is 3·0 as against 2·1, and of m_2 2·0 against 1·3. The difference in the height of unworn teeth is equally striking. Second lower molar with a small supplementary external basal cusp at the bottom of the valley separating the main cusps; last molar with a slight indication of the same cusp, which is not found in *Talpa europæa* or *cæca*; although very possibly not constant, its presence is noteworthy.

Dimensions of the type (measured in skin):—

Head and body 126 millim.; tail 29; hind foot (s. u.) 19.

Skull: greatest length 36·7; basal length 31·6; zygomatic breadth 15; mastoid breadth 17·8; interorbital breadth 8; palate, length 16·2, breadth outside m^1 11·1, inside m^1 4·7.

Hab. Neighbourhood of Rome. Type from Ostia; a second specimen from Frascati.

Type. B.M. no. 1. 1. 2. 8. Collected August 1900, and presented by Dr. L. Sambon.

This mole, by its powerful teeth, is remarkably different from all its allies, and it is most surprising that it has not been distinguished before.

BIBLIOGRAPHICAL NOTICES.

First Steps in Photo-Micrography. A Handbook for Novices. By F. Martin Duncan, F.R.H.S. London: Hazell, Watson, and Viney, 1902. Pp. 104. Price 1*s*.

This little book should prove a useful guide to the difficult art of photo-micrography. Commencing at the very beginning of the subject, the reader is led by gradual steps onwards until the photography of such minute objects as bacteria is reached. The first part of the book is devoted to the actual process of taking the photograph, the second to developing the negative, printing, and the preparation of objects. The apparatus employed is fully described, and directions are given for its home-manufacture, together with a number of practical "tips," the outcome of the author's experience. The directions given for the preparation of objects are necessarily brief, but are, perhaps, sufficient for the beginner. A concluding chapter deals with stereo-photo-micrography, and the advantages of this neglected branch are emphasized.

Report on the Collections of Natural History made in the Antarctic Regions during the Voyage of the 'Southern Cross.' London: the Trustees of the British Museum. Pp. 344, pls. liii. 1902.

Zoologists both of the present generation and for generations to come will doubtless hold the name of Sir George Newnes in grateful remembrance for his splendid munificence in fitting out the expedition of the 'Southern Cross' in 1898 for the exploration of the inhospitable regions of the Antarctic. Thereby the cause of science has been materially furthered and we have advanced a stage in our knowledge of these mysterious and dread shores.

The present handsome volume, embodying the zoological, botanical, and mineralogical results of the expedition, has been published by the Trustees of the British Museum in return for the handsome donation of the first set of all the specimens collected. The names of the authorities selected to work out the collections are a sufficient guarantee that the best account possible has been obtained of the several groups—animals, plants, and minerals—that were obtained during those two years of arduous work.

Captain Barrett-Hamilton's Report on the Seals will prove an extremely valuable addition to our knowledge of these animals, more especially as regards their dentition and the modifications thereof. Undoubtedly the most valuable of his observations is his contention that the remarkable and unique teeth of *Lobodon*, which apparently feeds almost entirely on *Euphausia*, serve the purpose of a sieve like the baleen of the Balænidæ. It is a pity that figures of these teeth were not given, since space is found for a whole plate showing the dentition of *Ommatophora*. Not that these last are not worthy of the space they occupy; on the contrary, on account of their extraordinary individual variability their omission would have been a mistake.

It is a matter for serious regret to read at the end of Capt. Hamilton's introduction that, owing to the want of care after the death of the zoologist Nicolai Hanson and the unfortunate and inexplicable loss of his notes, the skulls are practically worthless, so that the "whole work will have to be performed again from the collections procured by the various expeditions which started in 1901."

The Report on the Birds has been prepared by Dr. Bowdler Sharpe, who has contrived to make it one of the most interesting in the whole volume. By a series of judiciously selected quotations from the published records of Mr. Bernacchi, the magnetic observer, Mr Hugh Evans, the assistant zoologist of the expedition, Mr. Howard Saunders, and others, he has brought the account of the Antarctic avifauna completely up to date.

The Fishes were entrusted to Mr. Boulenger, who has described eight new species, two of which belong to hitherto undescribed genera.

Of the Invertebrates the most important contributions are those on the Mollusca by Mr. Edgar Smith, the Crustacea by Mr. T. V. Hodgson, now the zoologist of the 'Discovery' expedition, the Polychæta by Dr. Arthur Willey, and the Actiniæ by Mr. Joseph Clubb. Two species of those Actinians possessed special brood-chambers, and the description of these forms a feature of considerable value in this Report, since the author, in addition to his own excellent work, has briefly summarized the labours of Verrill and Carlgren on the same subject.

The Report on the Botanical Collections occupies something less than two pages; but it would seem from the remarks of Mr. Gepp, in his account of the Musci, that some of the collections which have been recorded elsewhere as having been made on this expedition failed to reach the Museum.

The Report on the Rock specimens is written by Mr. G. T. Prior. It is to be hoped that his surmise that "future exploration may possibly lead to the discovery of fossiliferous Mesozoic rocks" will be proved to be correct by the researches of the 'Discovery' expedition.

Not the least valuable part of this book is contained in the "Extracts from the Private Diary of the late Nicolai Hanson." These extracts have been rescued from oblivion by the efforts of Dr. Sharpe. Nicolai Hanson, it will be remembered, was the zoologist of the expedition, and was the only member thereof to succumb to the rigours and hardships inseparable from a sojourn in a region so inhospitable. Intended only for the perusal of his wife, this diary naturally contained merely references to such zoological facts as would be likely to interest one who was not a professed zoologist. His detailed and scientific observations were entered in a series of separate note-books which contained most precious information concerning the life-history of the creatures which came under his ken and of the specimens daily added by him and his assistant Mr. Evans to the collection. These note-books, we are told, "were handed to the commander of the expedition by the dying naturalist . . . . on the 14th of Oct., 1899." The only record we have of their contents are some observations from one of these books by the commander of the expedition; the rest have disappeared, and with them the fruits of the untiring labours of him whose zeal, as is shown by the diary to his wife, overtaxed his strength and ultimately brought about his death. The loss to zoological science of so gifted a naturalist is undoubtedly great, but it is rendered doubly great by the deplorable disappearance of these books, whereby he has been robbed of the reward of the labours which cost him his life and this Report has been materially impoverished.

MISCELLANEOUS.

Notes on the Histeridæ (Ann. & Mag. Nat. Hist. 1902, vol. x. p. 273).

By G. Lewis, F.L.S.

Owing to a misprint in Scudder's list of genera I used the name of *Coptostethus* in establishing a new genus. The name was used in 1854 by Wollaston, so I wish to substitute *Coptotrophis* for *Coptostethus*.

INDEX TO VOL. X.

Acanthaspis, new species of, 184.

Acanthodon, new species of, 9, 320.

Adæidæ, characters of the new family, 513.

Adrapsa, new species of, 502.

Æthriscus, characters of the new genus, 329.

Ailurus, new subspecies of, 251.

Amorphosoma, new species of, 330.

Amphistiidæ, characters of the new family, 300.

Ampulex, new species of, 54.

Apobletes, new species of, 223.

Arachnida, new, 6, 315, 368.

Araneæ, new African, 9.

Ariolica, new species of, 49.

Arrow, G. J., on Tropical American Dynastidæ, 137

Asterolecanium, new species of, 468.

Asthala, new species of, 502.

Ateleopus, note on the genus, 402.

Atelopus, new species of, 397.

Atkins, E., on the bees of the family Nomadidæ, 40.

Barbus, synopsis of African species of, 433; new species of, 426.

Batrachians, new, 152, 394.

Beecher, Prof. C. E., on Pennsylvanian Phyllocarida, 76.

Benedenius dencensis, remarks on, 52.

Bingham, Lt.-Col C. T., on Hymenoptera from the Transvaal, 207.

Bleptina, new species of, 500.

Bongo, on the E.-African representative of the, 309.

Boocercus, definition of the new generic name, 309.

Books, new:—Palæontologia Indica; ser. xvi. vol. i. pt. 3, 71. n. s. vol. i pt. 2, 73; ser. ix. vol. ii. pt 2, 170; ser. xv. vol. iii. pt. 1, 336, ser. xvi. vol. i. pt. 1, 340; n. s. vol. i. pt. 3, 418; International Catalogue of Scientific Literature, 333; Fauna of British India, Rhynchota, 335; Biologia Centrali-Americana—Hemiptera-Heteroptera, vol. ii., 419; Koehler and Bather's Gephyrocrinus Grimaldii, 420; Duncan's First Steps in Photo-Micrography, 517; Report on the Collections of Natural History made during the Voyage of the Southern Cross, 517.

Boulenger, G. A., on a new S.-African Galeid Selachian, 51; on Benedenius dencensis, 52; on new Cichlid fishes from Lake Nyassa, 69; on the systematic position of the genus Lampris and on the suborder Catosteomi, 147; on new S.-American apodal batrachians, 152; on a new Cyprinodontid fish, 153; on fishes from Gondokoro, 260; on the systematic position of the Pleuronectidæ, 295; on new batrachians and reptiles from Peru and Bolivia, 394; on the genus Ateleopus, 402; on new fishes from Abyssinia, 421; on a new species of Pseudechis, 494.

Brachysiderus, new species of, 146.

Brachytheliscus, characters of the new genus, 317.

Broomiella, characters of the new genus, 7.

Buccinum grœnlandicum, new variety of, 353.
Bufo, new species of, 396.
Buthus, new species of, 373.
Cæcilia, new species of, 152.
Cærostris, new species of, 326.
Caloptenopsis, new species of, 241
Cambridge, F. P., on the genus Latrodectus, 38; notes on nomenclature, 89.
Cameron, P., on new fossorial Hymenoptera from the Khasia hills, 54, 77.
Canthesancus, new species of, 178.
Catostomi, on the new suborder, 147.
Centraspis, new species of, 202.
Centrocnemis, new species of, 181.
Centrolophus, notes on species of, 194.
Centruroides, new species of, 375.
Ceratocephala, note on a new species of, 258.
Cerceris, new species of, 57, 214.
Cercopithecus, new species of, 243.
Cerilocus, new species of, 188.
Ceroma, new species of, 8.
Chimarrogale, new species of, 105.
Chrysomphalus, new species of, 470.
Clarias, new species of, 438.
Cleptria, new species of, 290.
Cleve, Prof. P. T., notes on recent publications concerning Diatoms, 27.
Cnemidophorus, new species of, 400.
Coccidæ, new, 465.
Cockerell, T. D. A., on the bees of the family Nomadidæ, 40; on some Coccidæ from Mexico, 465.
Coendou, new species of, 169, 249.
Coleoptera, new, 137, 223, 265, 380, 404, 489.
Coptostethus, characters of the new genus, 273.
Corymica, new species of, 47.
Crabro, new species of, 59.
Crustacea, new, 3, 361; of East Finmark, on the, 476.
Crustacean fauna of New Zealand, notes on the, 462.
Cubiceps, notes on species of, 122.
Curculionidæ, New S.-African, 404, 489.
Cyclocephala, new species of, 138.
Cyclopes, new subspecies of, 250.
Cyrtocara, characters of the new genus, 69.
Dresia, new species of, 6.
Deguernea, definition of the new generic name, 465.
Diatoms, notes on recent publications concerning, 27.
Dinopsis, new species of, 323.
Discoelius, new species of, 218.
Distant, W. L., on the Hydrometridæ, Henicocephalidæ, and Reduviidæ, 173, 282.
Dittopternis, new species of, 240.
Donald, Miss J., on Proterozoic Gasteropoda, 75.
Duerden, Dr. J. E., on the morphology of the Madreporaria, 96, 382.
Dynastidæ, on some Tropical American, 137.
East Finmark, on the natural history of, 341, 472.
Eblisia, new species of, 229.
Ectomocoris, new species of, 283.
Ectothyris, new species of, 48.
Elaps, new species of, 402.
Epeolus, note on the genus, 44.
Equidæ, on the existing species of, 304.
Equus, new subspecies of, 308.
Eretmotus, new species of, 265.
Eriococcus, new species of, 469.
Erium, new species of, 465.
Euagrus, new species of, 318.
Eulota, new species of, 332.
Eumenes, new species of, 220.
Euprosthenops, new species of, 18.
Eupterote axesta, description of the female of, 47.
Eusemia, new species of, 495.
Exosternus, characters of the new genus, 233.
Fishes, new, 51, 69, 153, 264, 421; on the classification of Teleostean, 147, 295.
Ganesella, new species of, 333.
Gasteropoda, on Proterozoic, 75.
Genetta, new species of, 162, 487.
Geological Society, proceedings of the, 75.
Graphipterus variegatus, on the stridulating-organ in, 154.
Gude, G. K., on two new land-shells, 332.
Hæmatolœcha, new species of, 280.
Harpactira, new species of, 316.
Hemitilapia, characters of the new genus, 70.
Henicocephalidæ, revision of the, 174.

Henicocephalus, new species of, 174.
Hermachastes, new species of, 14.
Heteroptera, new, 174, 283
Heteropternis, new species of, 240.
Hipporrhinus, new species of, 404, 439.
Hister, new species of, 238
Histeridæ, new, 223, 265.
Homalocranium, new species of, 401
Homoptera, new, 465
Hydrometridæ, revision of the, 173.
Hyla, new species of, 394
Hylodes, new species of, 396
Hymenoptera, new, 54, 77, 207.
Ia, characters of the new genus, 163
Insidiatores, on the classification of the, 511
Ischyja, new species of, 497.
Khafra, characters of the new genus, 185.
Kirby, W. F., on new species of Locustidæ, 239, on a new genus and species of apterous locust, 380
Lampris, on the systematic position of the genus, 147.
Lankester, Dr E Ray, on the specific name of the Okapi, 417
Larifugidæ, characters of the new family, 513.
Latrodectus, note on the genus, 38.
Lepidoptera, new, 47, 495.
Leptophis, new species of, 458.
Leucania Moorei, definition of the new name, 50.
Lewis, G., on new species of Histeridæ, 223, 265, 519
Lichtensia, new species of, 467.
Liolæmus, new species of, 397.
Lirus, notes on species of, 195.
Locustidæ, new, 239, 380
Lönnberg, Dr. E., on snakes from N W. Argentine and Bolivia, 457.
Luvarus imperialis, on the systematic position of, 278.
Lycomedes, new species of, 143.
M'Intosh, Prof, on an abnormally coloured plaice, 252; on an example of Regalecus glesne, 253; on sharks captured at St. Andrews, 254; on British Nereidæ and Staurocephalidæ, 255, on a new Ceratocephala, 258
Madoqua, new subspecies of, 242.
Madreporaria, on the morphology of the, 96, 382
Mammals, new, 159, 162, 163, 166, 169, 242, 243, 244, 246, 251, 308, 309, 311, 403, 417, 487, 491, 493, 516; of East Finmark, on the, 348, 472.
Maukuninga, characters of the new genus, 188.
Marlianus, characters of the new genus, 191.
Marmosa, new subspecies of, 159.
Marshall, G A. K, on new S African Curculionidæ, 404, 439.
Megalocræerus, characters of the new genus, 231.
Melecta, note on the genus, 45.
Mendis, new species of, 291
Menneus, new species of, 325
Mereschkowsky, C., notes on recent publications concerning Diatoms, 27
Meriones, new species of, 488.
Microtus, new species of, 167.
Mimon Bennettii, note on, 53.
Mindarus, new species of, 289.
Moggridgea, new species of, 310.
Mole of the Roman district, on the, 516
Mollusca, new, 332, of East Finmark, on the, 350, 473
Mus, new species of, 490, 491.
Myotis, new species of, 493.
Myzine, new species of, 88.
Nagoda, new species of, 47.
Nemachilus, new species of, 437.
Nereidæ, on British and other, 255, 258.
Nitornus, new species of, 177.
Nomada, note on the genus, 41.
Nomadidæ, on the family, 40.
Nomenclature, notes on, 80.
Nomeus, note on the genus, 121.
Norman, Canon A. M., on the natural history of East Finmark, 341, 472.
Notodoma, new species of, 267.
Odynerus, new species of, 222.
Okapia, new species of, 417.
Omalodes, new species of, 237.
Onus mustela, on the pelvic fins in the postlarval and young stages of, 132.
Opaon, characters of the new genus, 380.
Opiliones, on the morphology and classification of the, 504.
Opistoplatys, new species of, 176.
Oreosaurus, new species of, 400.

Orestias, new species of, 153.
Orthoptera, new, 239, 380.
Oryctolagus, new subspecies of, 244.
Oryzomys, new subspecies of, 247.
Otomys, new species of, 311.
Oxaenanus, new species of, 503.
Pachycraerus, new species of, 231.
Palpimanus, new species of, 18.
Palystes, new species of, 23, 27.
Pandinus, new species of, 303.
Parabuthus, notes on some species of, 365.
Paramithrax, new species of, 361.
Parasa, new species of, 48.
Paratilapia, new species of, 69, 264.
Paul, D. M., on the pelvic fins in the postlarval and young stages of Onus mustela, 132.
Pelmatorycter, characters of the new genus, 12.
Peprilus, note on the genus, 204.
Petrochromis, new species of, 70
Phelister, new species of, 235.
Philanthus, new species of, 65, 212.
Philodryas, new species of, 460.
Phoxonotus, new species of, 209.
Phyllomedusa, new species of, 395.
Phyllotis, new subspecies of, 248.
Pirates, new species of, 284.
Plagiostethi, on the classification of the, 504.
Plaice, on an abnormally-coloured, 252.
Platymeris, new species of, 185.
Platyoides, new species of, 19.
Platysoma, new species of, 226.
Pleurocrypta, new species of, 3.
Pleuronectidæ, on the systematic position of the, 205.
Pocock, R. I., on new African Solifugæ and Araneæ, 6; on the stridulating-organ in Graphipterus variegatus, 154; on the existing species of Equidæ and a new subspecies of Zebra, 304; on some new African spiders, 315; on the systematics of scorpions, 304; on the morphology and classification of the Opiliones, 504.
Podateles, definition of the new generic name, 408.
Pompilus, new species of, 82.
Prostherapis, new species of, 397.
Psen, new species of, 63.
Psenes, notes on species of, 124.
Psenopsis, notes on species of, 130.
Pseudagonia, new species of, 66, 207.
Pseudechis, new species of, 494.
Pygolampis, new species of, 176.
Reduviidæ, revision of the, 175, 282.
Reduvius, new species of, 182.
Regalecus glesne, note on an example of, 253
Regan, C. T., revision of the Stromateidæ, 115, 194; on the systematic position of Luvarus imperialis, 278.
Reninus, new species of, 271.
Reptiles, new, 397, 457, 494.
Rhinatrema, new species of, 153.
Rhodoneura, new species of, 50.
Rhopalurus, new species of, 377.
Rhynchocyon, new species of, 403.
Rothus, new species of, 16.
Saica, new species of, 175.
Saimiri, new subspecies of, 246.
Salius, new species of, 77
Santosia, new species of, 288
Schottus, characters of the new genus, 293.
Scodra, new species of, 315.
Scorpions, contribution to the systematics of, 304.
Scott, T., on Scottish Crustacea, 1.
Scylliogaleus, characters of the new genus, 51.
Scytodes, new species of, 321.
Selenops, new species of, 21, 330
Seriolella, notes on species of, 127.
Sharks, on, captured at St. Andrews, 254.
Sirthenea, new species of, 286.
Sminthopsis, new subspecies of, 492.
Sminthus, new species of, 190.
Solifugæ, new African, 6.
Sparassus, new species of, 25.
Spencerella, new species of, 17.
Spiniger, new species of, 187.
Spodistes, new species of, 145.
Stasimopus, new species of, 9, 310.
Staurocephalidæ, on British, 257.
Stenotrophis, characters of the new genus, 233.
Sthenometopa, definition of the new generic name, 481.
Stromateidæ, revision of the, 115, 194.
Stromateoides, notes on species of, 205.
Stromateus, notes on species of, 203.
Swinhoe, Col. C., on new Eastern and Australian moths, 47, 495.

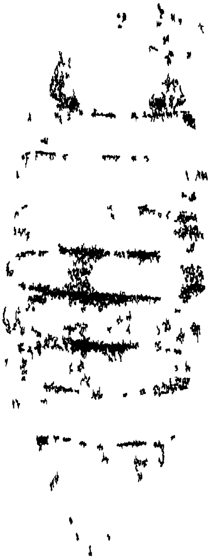
Sypna, new species of, 496.
Tachytes, new species of, 64.
Takahashia, new species of, 466.
Talpa, new species of, 516.
Teretriosoma, new species of, 275.
Teretrius, new species of, 276.
Tetragonurus, note on the genus, 206.
Thalassius, new species of, 15.
Thomas, O., on the genera Mimon and Tonatia, 53; on Marmosa marmota and elegans, 158; on the genet of the Balearic Islands, 162; on new mammals from China, 163; on a new vole, 166; on a new Centr.-American porcupine, 169; on a new dik-dik from Brit. E. Africa, 242; on a new monkey from Nyasaland, 243; on two new hares, 244; on new forms of Saimiri &c., 246; on the panda of Sze-chuen, 251; on the E.-African representative of the Congo, 309; on new forms of Otomys, 311; on a new Rhynchocyon from Nyasaland, 403; on new Australian mammals from Arabia and Persia, 487; on new Australian mammals, 491; on Azara's Chauve-souris onzième, 493; on the mole of the Roman district, 516.
Thomson, G. M., on a new species of Paramithrax, 361; on the Crustacean fauna of New Zealand, 462.
Tiarodes, new species of, 190.
Tiphia, new species of, 86.
Tityus, new species of, 378.
Tonatia, note on the genus, 53.
Triænobunidæ, characters of the new family, 512.
Tribelocephala, new species of, 175.
Tropidurus, new species of, 399.
Tryponæus, new species of, 272.
Urodacus, new species of, 370.
Vilius, new species of, 292.
Vulpes, new species of, 489.
Waterhouse, C. O., on two new Buprestidæ, 330.
Xylonæus, characters of the new genus, 274.
Zeorhombi, characters of the new division, 302.
Zethus, new species of, 499.
Zirta, new species of, 290.

END OF THE TENTH VOLUME.

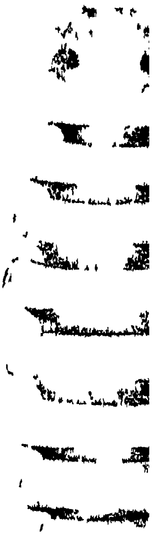
PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

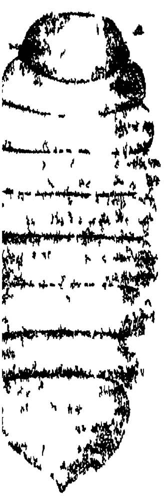
1

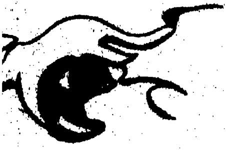
2



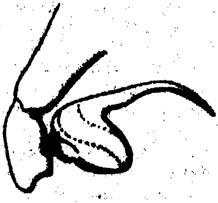
3



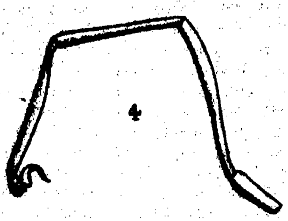




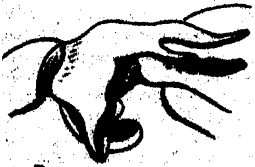
6.



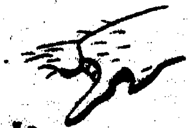
4a.



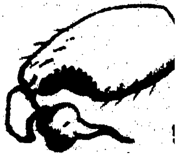
4

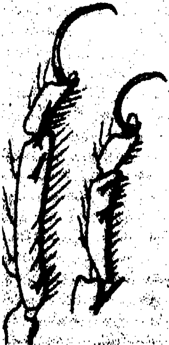


5.

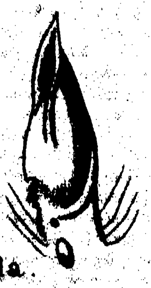


5a.

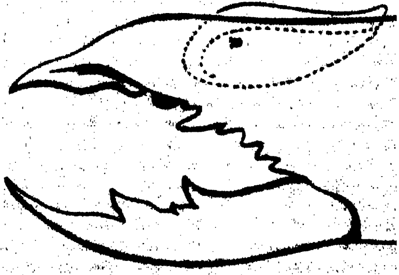




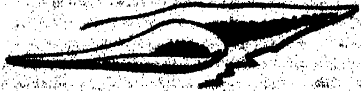
3b.



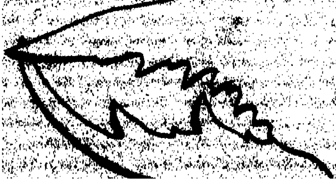
1a.

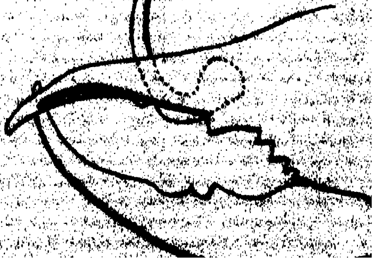


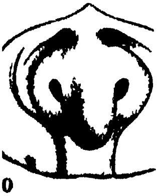
1.

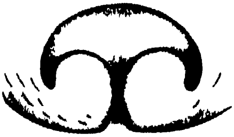


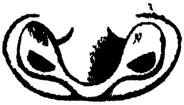
2a.

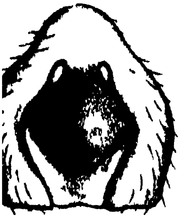


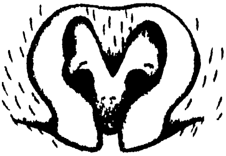


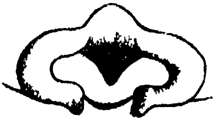

0

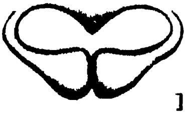

8

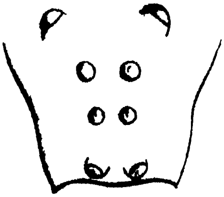

2

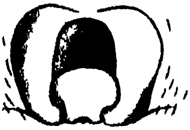


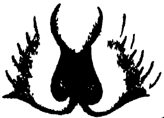

7

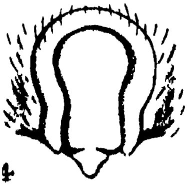

3

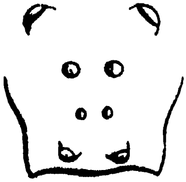

1

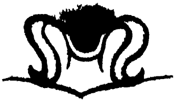

5

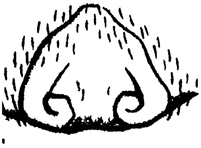

3

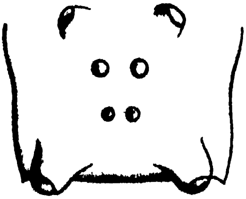

6

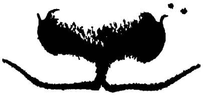

4

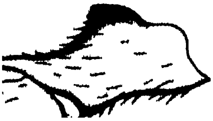

4a

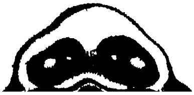

4

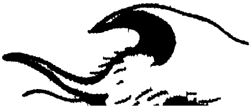


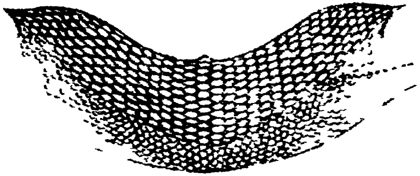

6a

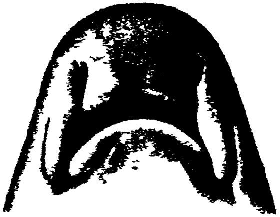








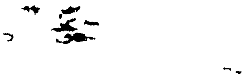




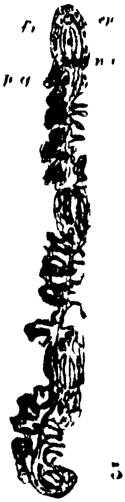
1

2

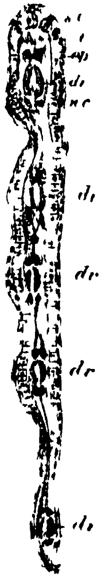
3



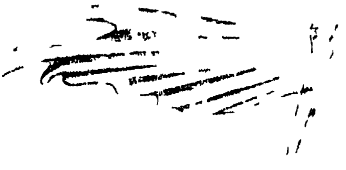
4



5

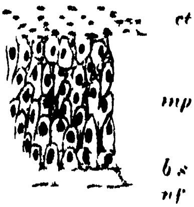


7

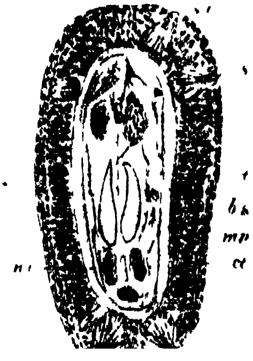


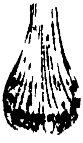
6

9



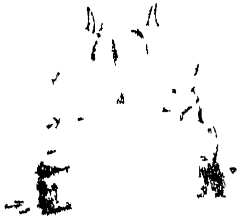
8



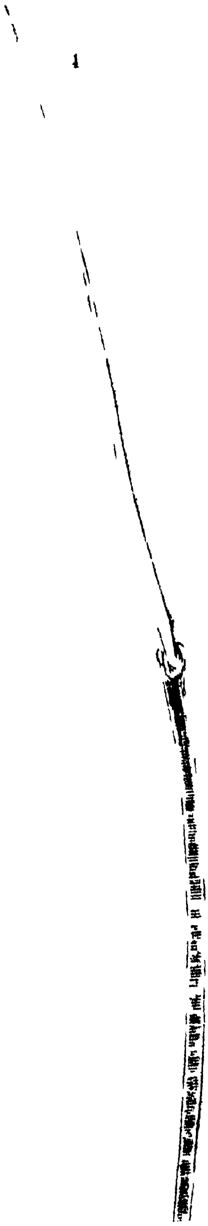


10

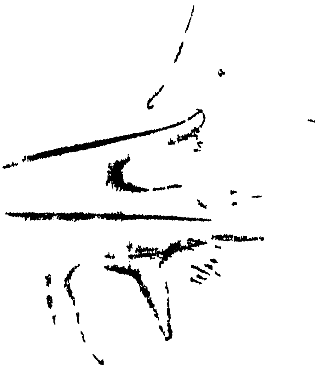
1



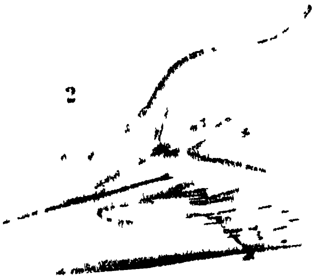
4

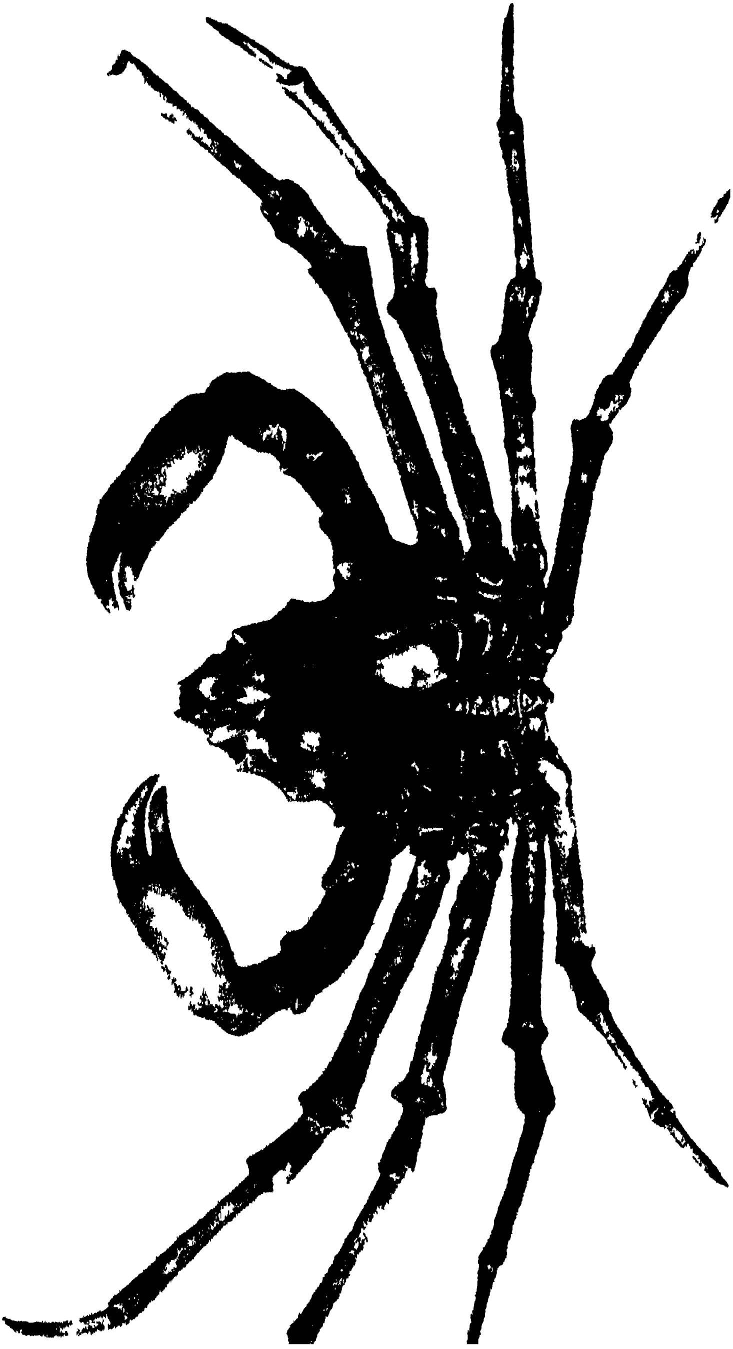


3



2





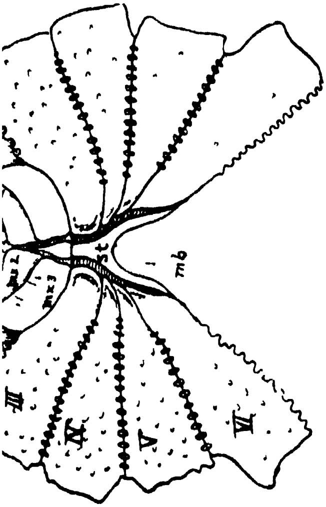
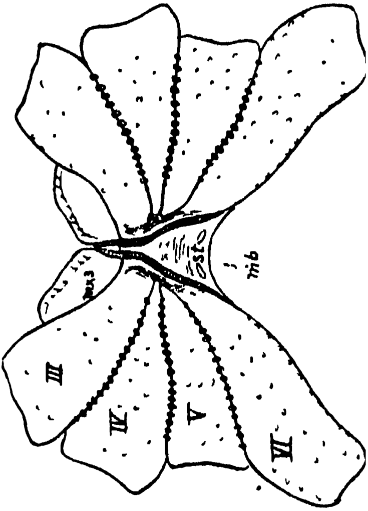

mx2
mx3
st
mb
III
IV
V
VI

Fig. 3 A.


mx3
st
ost
mb
III
IV
V
VI

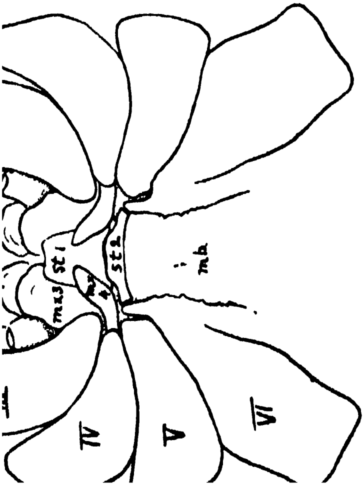

st1
st2
mx3
mx4
mb
IV
V
VI

Fig. 1 B.

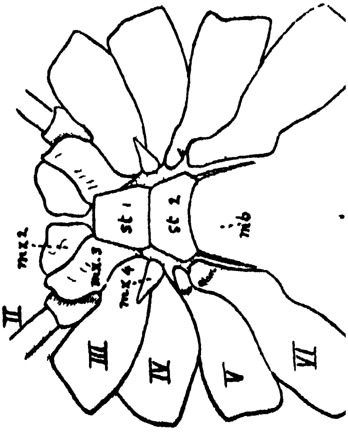

mx2
mx3
mx4
st1
st2
mb
II
III
IV
V
VI

Fig. 3 B.

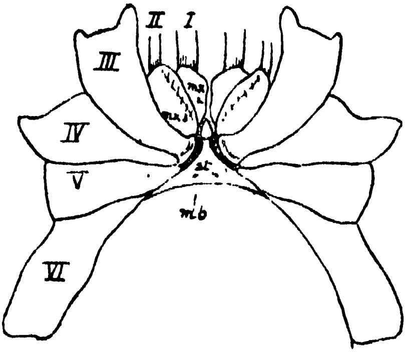
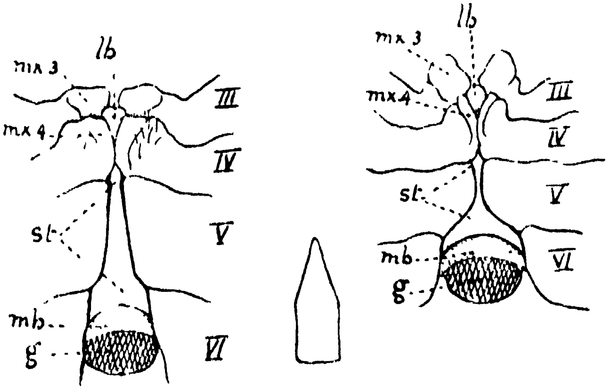


Fig. 4.



A. **C.** **B.**

Fig. 5.